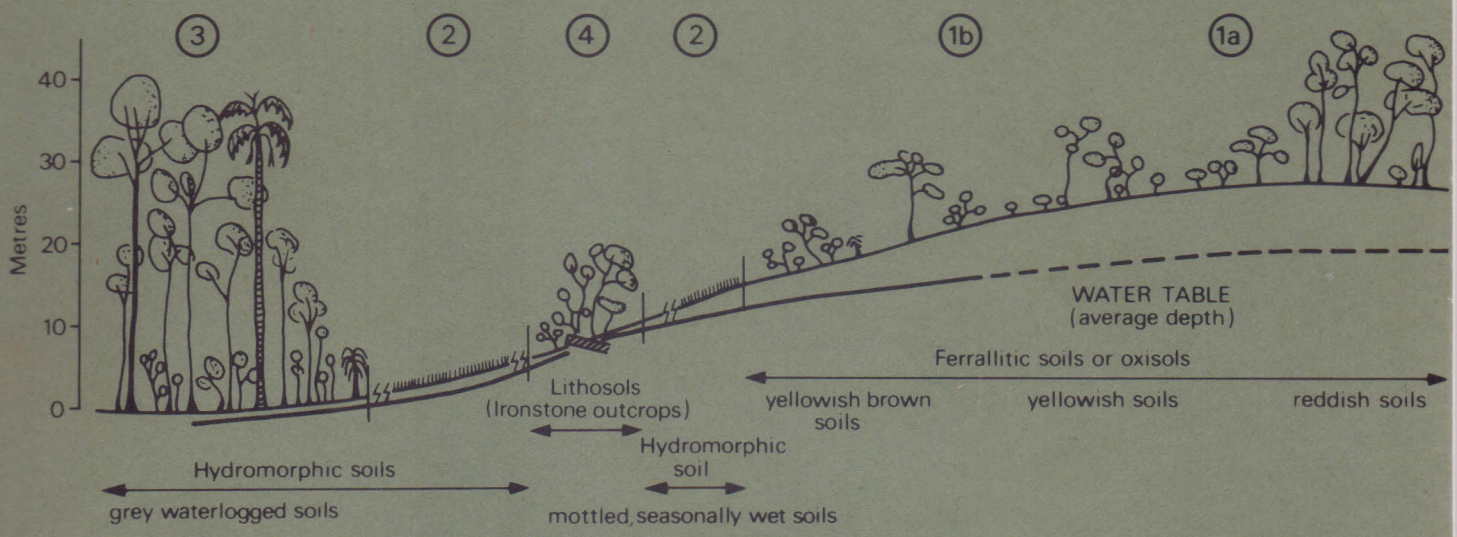
NOTES ON THE SOILS AND PLANT COMMUNITIES OF FAZENDA AGUA LIMPA

(BRASÍLIA, D.F. BRASIL)

P.A. FURLEY



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Peter Fowler

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With Compliments

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(Brasília, D.F. BRAZIL)

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Introduction

These notes represent the first stage of a continuing research programme concerned with the soils and soil-plant community relationships at Fazenda Água Limpa. They were initiated during the period October 1976 to November 1978 and slightly extended in August 1982. They are not intended to provide a detailed soil survey, for which the only satisfactory provision is the 1:100,000 scale project completed by the National Agricultural Survey Agency, SNLCS (EMBRAPA 1978) and the surveys completed as part of Projeto Radambrasil, with maps published at a scale of 1:1 million (Projeto Radambrasil) of which volume 29 covers Fazenda Água Limpa.

Although there have been some investigations of a pedological nature which are included here, notably on the nature and distribution of 'campos de murundus' (earthmound fields), the emphasis in this report lies in the provision of soil data to accompany and elucidate the patterns of vegetation. Consequently, the field work and soil analyses have been consistently related to the vegetation descriptions published by my colleague Dr. J.A. Ratter, and reference should be made to his monograph (Ratter 1980). At the present stage, the profiles have not been identified for certainty in conformity with the Brazilian Soil Classification or with international schemes. The identifications given are therefore both tentative and descriptive but follow the field methodology outlined by the Brazilian Soil Science Society (1973). The analytical procedures follow Vettori (1969) unless otherwise stated.

Fazenda Água Limpa covers some 4,062 ha and lies approximately 18km south west of the centre of Brasília (Figure 1). It has been owned since the early 1960's by the University of Brasília for which it acts both as the University Farm and as the Ecological Reserve. There has been relatively little human disturbance in the area used for ecological research and measures have been taken to reduce the incidence of fires and to prevent the cutting of timber or other disturbing activities.

As is intended for the vegetation studies, the soil work aims to provide a basis for more detailed research in future years. Apart from unpublished material from the Department of Agriculture, the work reported here represents the initial investigations concerned with soil interpretation at Fazenda Água Limpa

Acknowledgements

Grateful thanks are given to many friends, colleagues and mestrado students who have helped to initiate pedological studies at Fazenda Agua Limpa. In particular, the enthusiasm of David Gifford will always be gratefully remembered. The help of James Ratter, Tony Raw, Colin Johnson, Mundayatan Haridasan, at the Laboratório de Ecologia (UNB), Elmer Wagner, Wenceslau Goedert and Luiz Azevedo at CPAC (Planaltina), Marcelo Carmargo (SNLCS, Rio de Janeiro) is especially appreciated. Many students taking the mestrado course in ecology have helped over the years and whilst I am indebted to many, the work of Ernesto Maués da Serra Friere and Mario Diniz de Araujo Neto was most closely associated with soils work at Fazenda Água Limpa. The analytical help afforded by the Laboratories at CPAC, Planaltina), SNLCS (Rio) and CPATU (Belém) were invaluable in the early days of establishing the ecology laboratory when facilities had not yet been developed.

Location of soil investigation

Figure 2 illustrates the sites chosen for detailed soil investigation. They may be divided for convenience, into six main groups:

1. the 'Campos de Murundus' (earthmound fields). See Ratter op.cit. pp. 25-27.

2. the catenary studies extending orthogonally to the slope and draining into Córrego da Onça traversing both open woody savanna (campo cerrado, Eiten 1972, Eiten and Goodland 1979), open dry grassland with occasional shrubs and trees (campo sujo), wet grassland (campo limpo) and gallery forest (mata ciliar). See Ratter op.cit pp. 24-25.

3. a line transect covering characteristic woody cerrado. See Ratter op.cit. pp 21-22.

4. a line transect extending from woodland savanna (or cerradão) through open woody savanna (campo cerrado) to open grassland with occasional trees and shrubs (campo sujo). See Ratter op. cit. pp. 22-24

5. a limited number of sites on well developed deciduous forest at the head (cabeceira) of Córrego Capitinga. See Ratter op. cit. pp. 47-53.

6. a limited survey of a Luhea paniculata site with characteristic mesotrophic soils. See Ratter op. cit. p. 272.

Figure 1

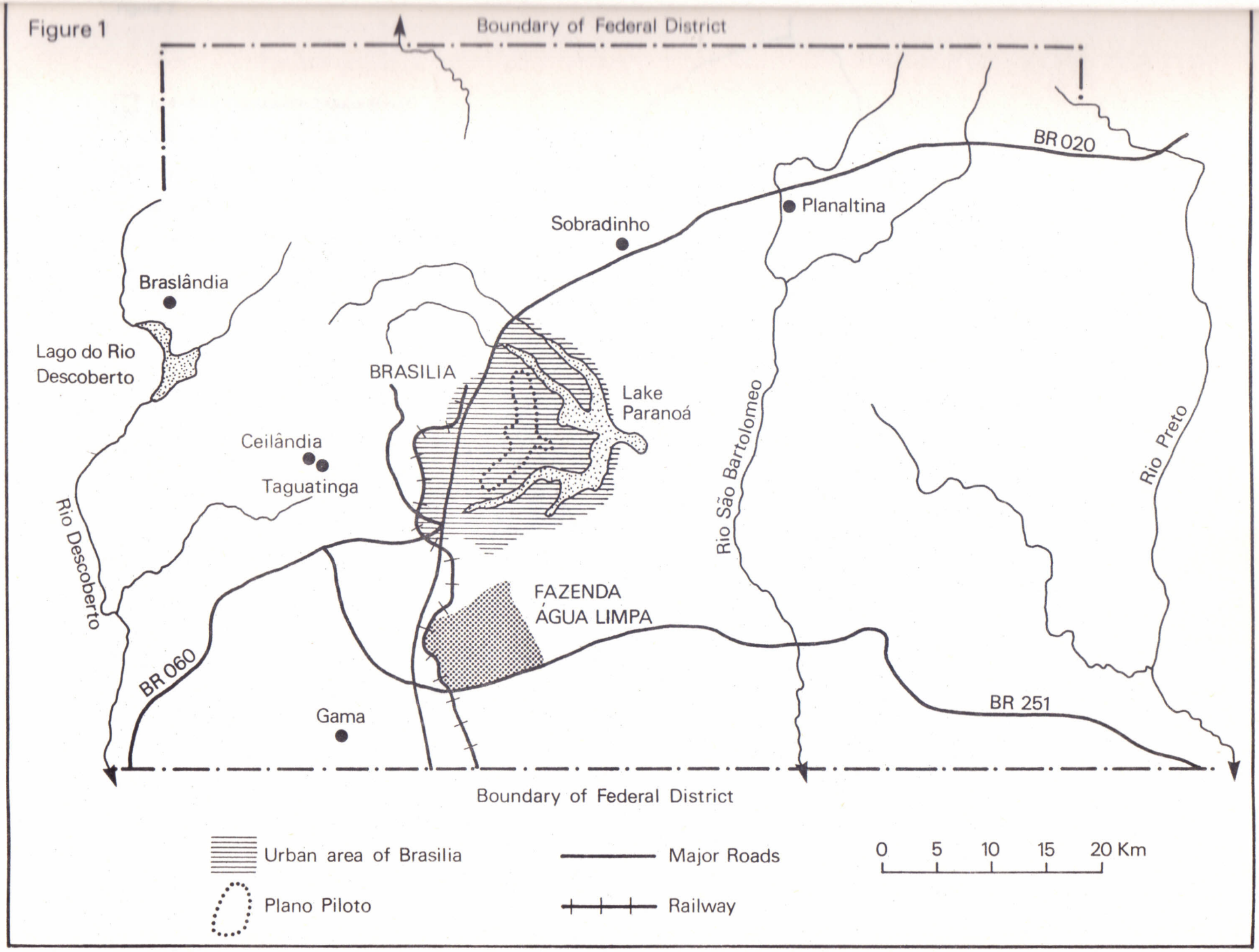
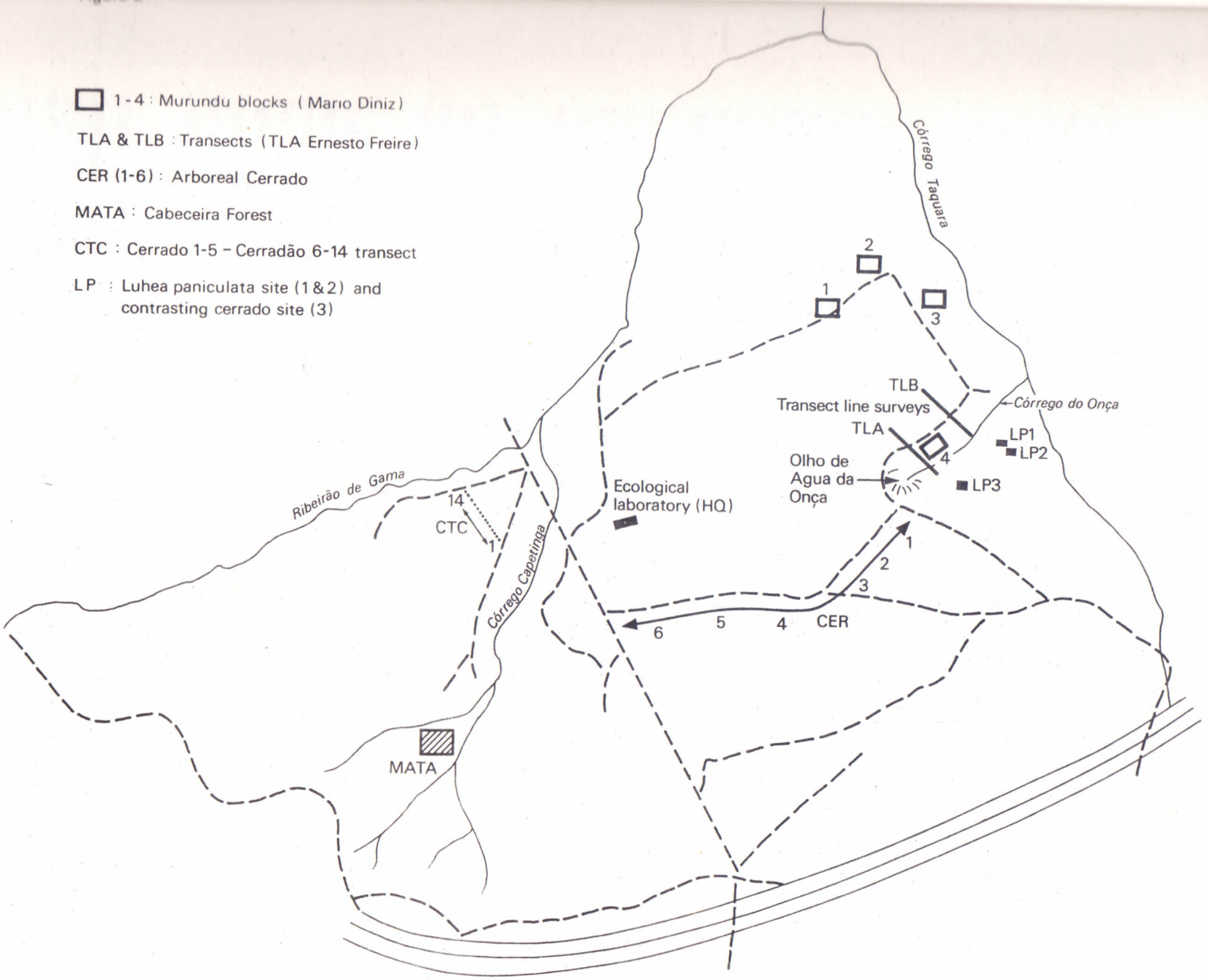

Boundary of Federal District
BR 020
Planaltina
Sobradinho
Braslândia
Lago do Rio Descoberto
BRASILIA
Lake Paranoá
Ceilândia
Taguatinga
Rio São Bartolomeo
Rio Preto
Rio Descoberto
FAZENDA ÁGUA LIMPA
BR 060
Gama
BR 251
Boundary of Federal District
Urban area of Brasilia
Plano Piloto
Major Roads
Railway
0 5 10 15 20 Km

Figure 2


1-4 : Murundu blocks (Mario Diniz)
TLA & TLB : Transects (TLA Ernesto Freire)
CER (1-6) : Arboreal Cerrado
MATA : Cabeceira Forest
CTC : Cerrado 1-5 – Cerradão 6-14 transect
LP : Luhea paniculata site (1&2) and contrasting cerrado site (3)
Córrego Taquara
Córrego do Onça
Ribeirão de Gama
Córrego Capetinga
Ecological laboratory (HQ)
TLB
Transect line surveys
TLA
Olho de Agua da Onça
LP1
LP2
LP3
CTC
CER
MATA

1. The 'campos de murundus' (earthmound fields)

1.1 Nature and classification of murundus in the cerrado of central Brazil

Throughout the cerrado (savanna) region of Central Brazil there occur repeated patterns of semi-elliptical earthmounds and depressions known as 'campos de murundus' or moundfields. Although they are widespread and form distinctive landscapes with characteristic distributions of soils and vegetation, they have never been described in detail or classified. During the course of detailed investigations since 1976 in an area around Brasília, Federal District (Diniz de Araujo Neto et alii. in preparation), a tentative working classification of murundus has been established based on their water relationships. This scheme appears to hold for the greater proportion of the central cerrado.

The campos de murundus are found in two principal situations (Figure 3)

(1) areas affected semi-permanently by ground water and seepage. The mounds in such areas form discrete island of woody cerrado with red yellow latosols (Acrustox and Haplustox soils, Soil Survey Staff 1975) surrounded by wet grassy depressions containing gleyed hydromorphic soils (Plinthaquox and Umbraquox). The accumulation of organic matter in the depressions can give rise locally to organic soils (Saprists and Folists). These conditions generally arise over the lower valley slopes or flat valley floors. Ground water is located close to the surface of the intermound depressions even during the dry season.

(2) areas affected by seasonal rainfall and runoff having little contact with ground water. The mounds are less perceptible and have a more linear form following the gradient of the slope. They are mostly covered by grassy or lightly wooded cerrado. Such areas are generally well drained and are underlain by cambisols or red yellow latosols (Dystropepts or Ustox soils).

Murundus vary in size, shape, orientation, type and diversity of plant cover, relationship to termite activity, soil properties and in their association with runoff and groundwater. Initially, attempts were made to classify murundus on the basis of morphology. This proved to be inconsistent as did shape and orientation. Attention was then turned to process factors.

It was widely believed that murundus are termite mounds, analogous to the termite savannas found in parts of Africa (Troll 1936, Pullan 1979). In central Brazil, this understanding was not based on detailed measurements but on the general observation that many of the mounds were occupied by termites. It was not clear whether the termites actively constructed all or part of the mounds or whether they simply occupied mounds where the environmental conditions were more suitable. The survey quickly established that the subsurface horizons of many of the mounds were not occupied by termites and no pedological evidence to indicated past occupance could be detected.

The remaining processes which appeared important in the evolution of murundus were surface and ground water movements. Many of the inter murundus depressions were channelled to varying degrees by surface water. Circular grooves around the base of the murundus also indicated water scouring. There was evidence, in the more pronounced murundus fields, that throughflow and lateral seepage sapped at the upper margins of the murundus fields and

thereby led to the creation of new mounds (Figure 4). Further, the alignment of mound summits indicated an accordance which continued the line of the surface upslope. This suggested that the mounds result from differential runoff and seepage and are therefore, residual features. In other areas and at greater altitudes and away from the influence of ground water and seepage, there were murundus fields exhibiting a much less accidented pattern of microrelief, sometimes giving a rippled appearance and in all cases relating closely to runoff. This situation was typical of the broad interfluvial crests but a similar pattern exists on linear slopes of low gradient.

Consequently a tentative two fold classification murundus is proposed based mainly on the water relationships of the mounds (Table 1). The classification has been tested in reconnaissance investigations in several areas of the central Brazilian plateau adjacent to the Federal District and appears to be valid over the region.

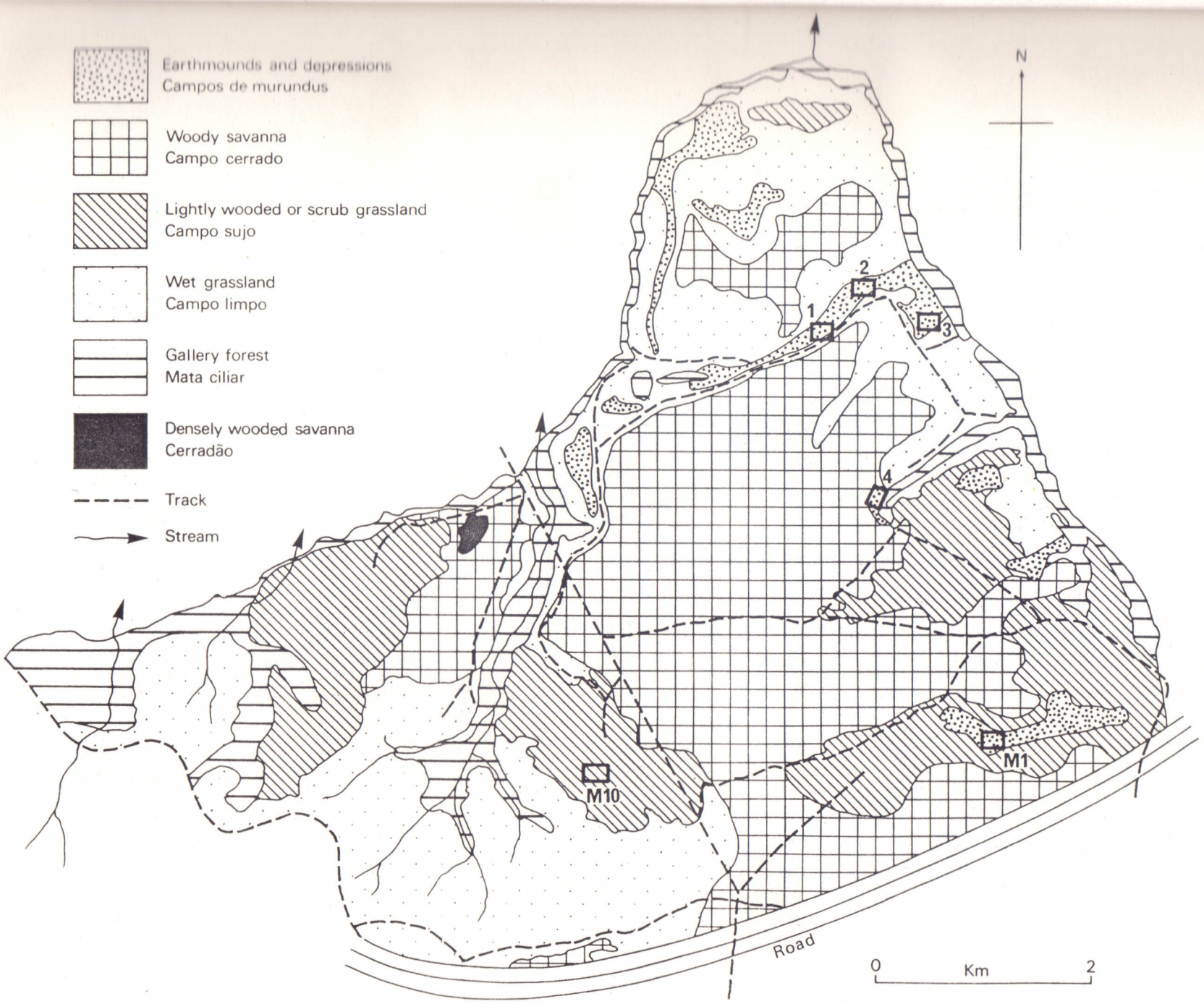

Earthmounds and depressions
Campos de murundus
Woody savanna
Campo cerrado
Lightly wooded or scrub grassland
Campo sujo
Wet grassland
Campo limpo
Gallery forest
Mata ciliar
Densely wooded savanna
Cerradão
Track
Stream
N
1
2
3
4
M1
M10
Road
0
Km
2

Figure 4

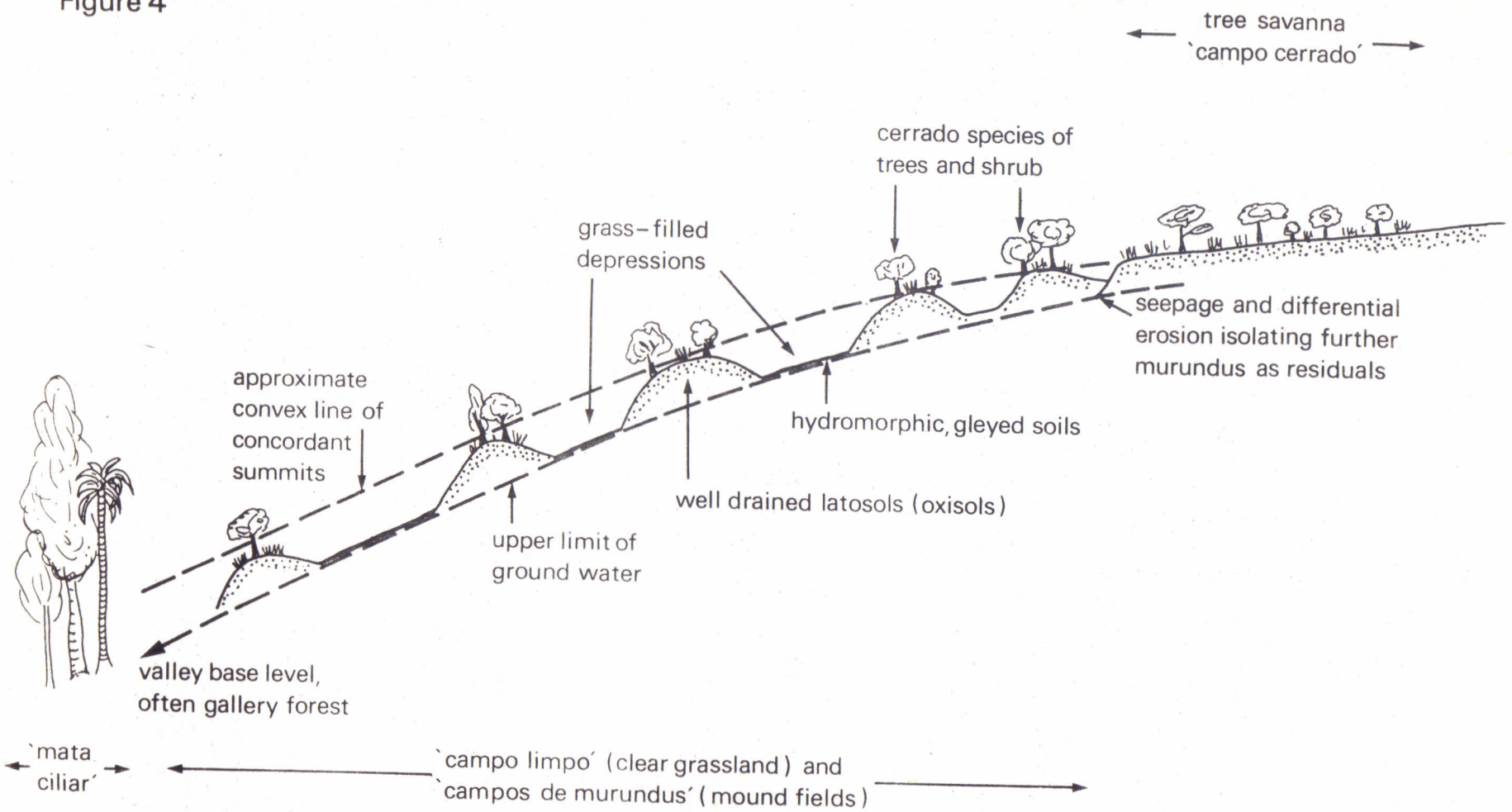

tree savanna
`campo cerrado´
cerrado species of
trees and shrub
grass–filled
depressions
seepage and differential
erosion isolating further
murundus as residuals
approximate
convex line of
concordant
summits
hydromorphic, gleyed soils
well drained latosols (oxisols)
upper limit of
ground water
valley base level,
often gallery forest
`mata
ciliar´
`campo limpo´ (clear grassland) and
`campos de murundus´ (mound fields)

Table 1: Classification of murundus

1. murundus associated predominantly with groundwater and seepage	
1a 'Cabeceira' type (headwaters of catchment basins)	Ground water close to the surface (headwaters of catchment basins) throughout the year, reaching the surface of inter mound depressions in wet periods; seepage at mound sides and mound field margins; downslope orientation
1b valley side sites	Ground water close to the surface in wet period; evidence of surface runoff but seepage less clear; field margins blurred; downslope orientation
1c valley floor sites (shallow minor streams)	Ground water and runoff evident in channels parallel to stream course; orientation with stream course in flat sites; clear field boundaries
2. murundus associated with runoff only; no contact with groundwater	
2a gently sloping interfluvial	Seasonal surface water flow; often a ripple effect in the microrelief; field boundaries not discernible; indistinct orientation but generally orthogonal to the slope
2b upper valley sides and steeper gradients of convex interfluves	Seasonal surface water flow; substantial mounds locally where water and soil conditions favourable; field boundaries discernible but not sharp; orientation changes with convexity and drainage

1.2 Physical and chemical analyses of sections traversing murundus

In order to investigate the nature and properties of murundus and their soils, two trenches were excavated through mounds in one of the most strikingly developed areas on the Fazenda (Site No 4, Figure 3) lying approximately 1 Km to N of Olho d' Água da Onça on a 3% slope. One mound showed no signs of termite activity and the soil profile showed no visual evidence of past activity. The second mound was chosen because it clearly contained an active termite colony. Six soil profiles were located at the first site and seven at the second. Soil samples were collected and analysed at each horizon. Additional analyses relating to other murundus sites on Fazenda Água Limpa are given in Diniz (1981).

(a) termite murundum: this site was excavated with the help of Helen Coles (Negret) an ecologist specialising in termites, as the feature was essentially a colonial Sinotermes mound with a very clearly galleried and layered structure. The trench was sited orthogonal to the slope which is oriented NW-SE. The trench was approximately 21m long and divided into six sections for analysis (Figure 5a). The vegetation cover ranged from wet grassland in the depressions upslope and downslope of the mound to a shrubby and open arboreal cerrado on the mound itself. Soil profile descriptions are given in Table 2. The soil properties analysed are summarised in Table 3.

No attempt will be made to analyse the data in detail here, but some of the distribution patterns are illustrated in Figure 6. In general, it may be said that the morphological, structural and physical properties of the mound and its soils are more striking than the chemical differences. Nevertheless, when the "A" horizon properties containing the termite population where present are compared with the non termite horizons over the traverse, there are a few consistent patterns:- the clay percentages increase from a mean of 57% clay at the sides of the mound to 65% clay in the mound; the pH levels are slightly less on the mound (termite affected sites) than at the sides (4.5 mean H_2O and 4.2 mean KCl compared to 5.1 H_2O and 4.3 KCl); the organic matter percentages - represented by organic carbon are lower at the surface on the mounds (3.3 as opposed to 4.4%), but the organic levels are higher to greater depths where termites have been active; there is a slightly greater Al^{3+} level on the the mound than at the sides (1.9 meq/100q as compared with 1.1 meq/100g).

Finally it is interesting to note the increased iron content associated with the nodular mottles at the upper margin of the ground water-affected zone. The nodules are particularly evident in the lowest sampled horizons in each profile.

(b) Non termite mound profiles: this site was excavated and described with the the help of the mestrado class in 1977. The trench had a S/SW to N/NE orientation with a total length of 21m divided into seven sections of 3m. Seven profiles were examined (Figure 5b) with a vegetation cover which ranged from wet depressional grassland to dry mound cerrado and returning to wet grassland. Within each 3m section there are considerable variations in the thickness of horizons, but generally the damp grassy sites overlie Hydromorphic (Lateritic) soils whilst the dry mound sites are made up of Red-Yellow Latosols. Soil profile descriptions for typical wet depression and dry mound sites are given in Table 4. The soil properties analysed are given in Table 5.

Although, for convenience, the mound is described as 'non-termite', there was evidence of ant and termite activity in the surface horizons of the mound and significant but less active ants and termites observed down to 85cm within the mound. However, the mound was not a galleried structure as described in (a).

Figure 5 (a) Surveyed form of termite mound indicating the trench traverse and profile locations

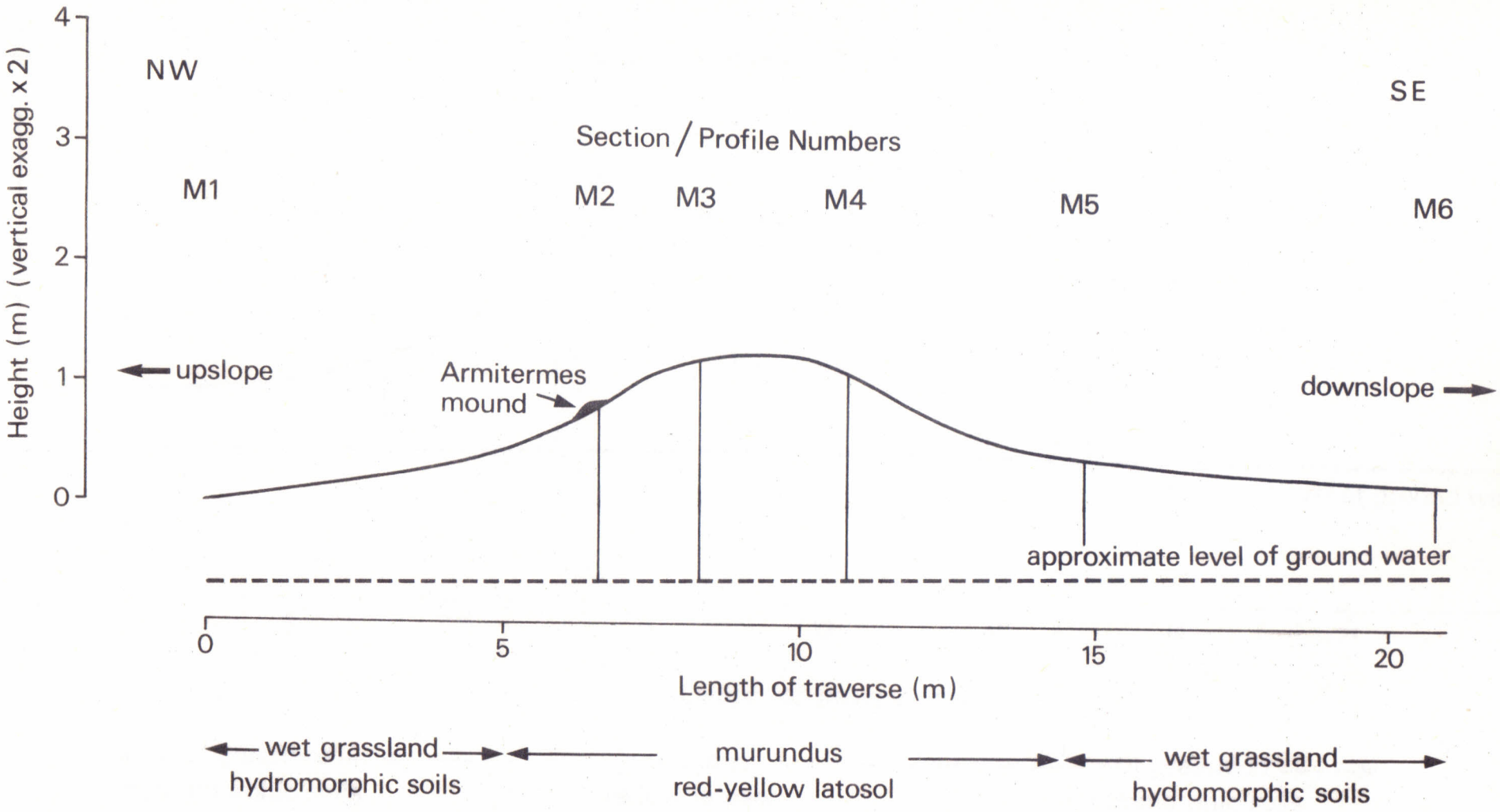


Figure 5 (b) Surveyed form of the non termite mound indicating the trench traverse and profile locations

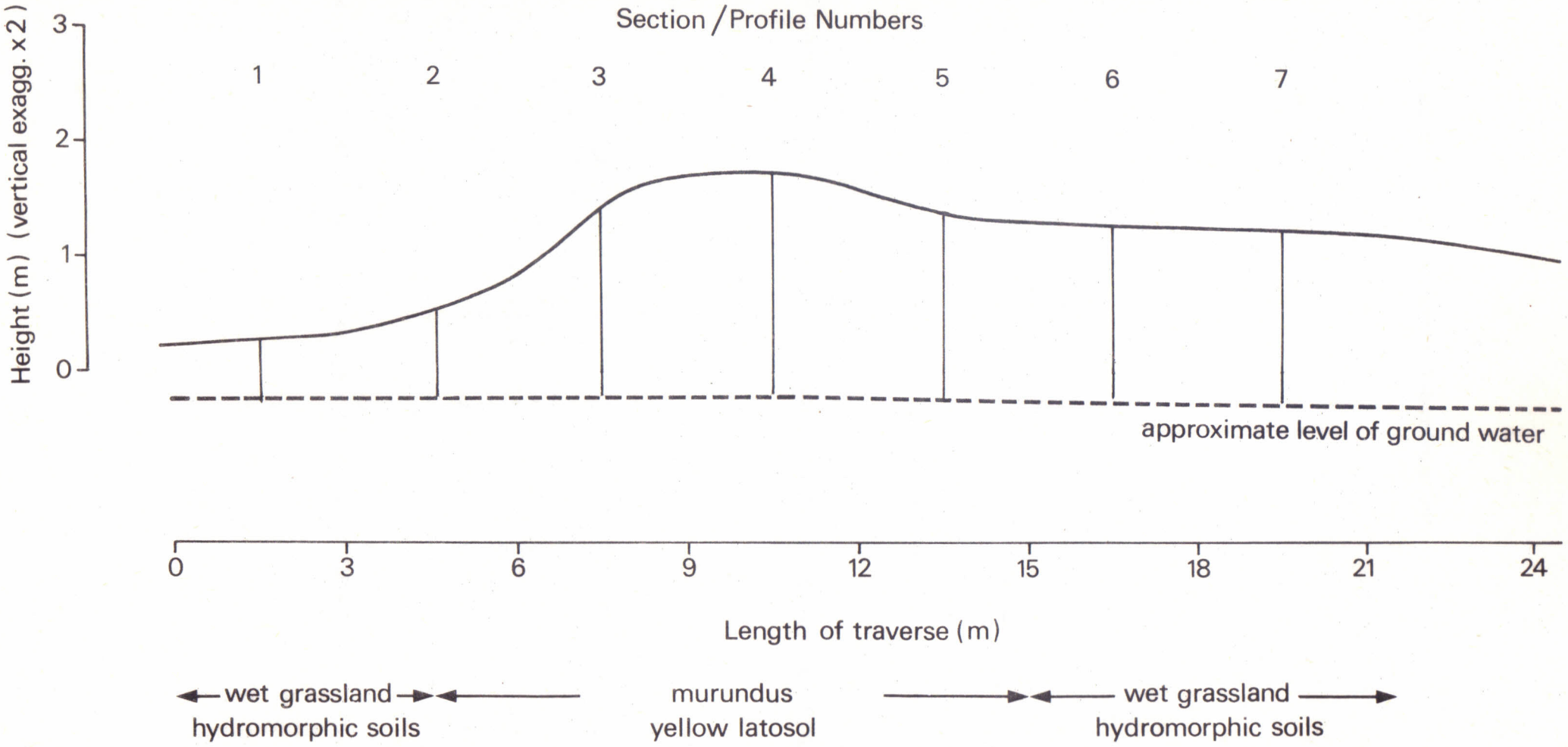


Figure 6 : Termite mound- soil property distributions

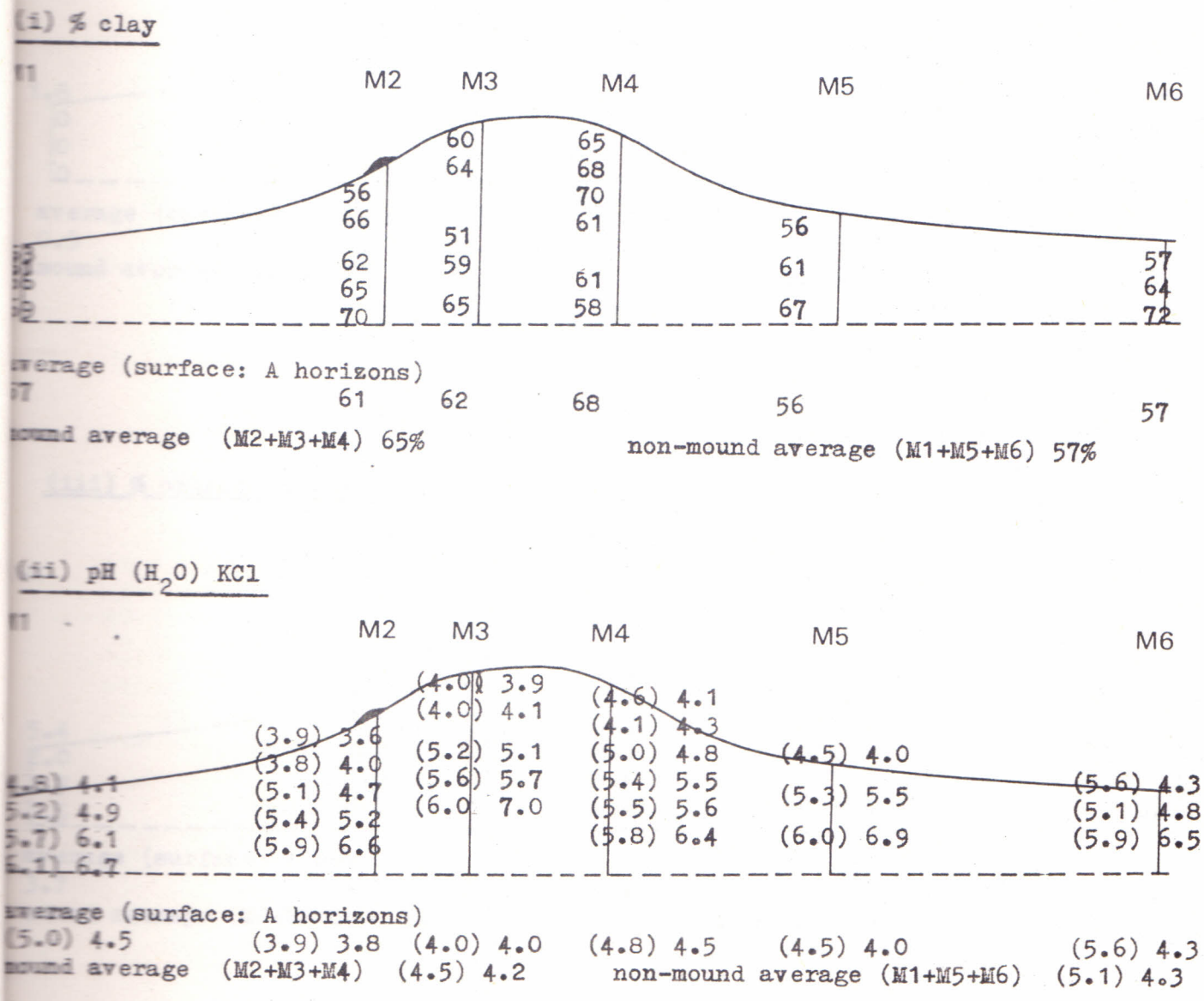
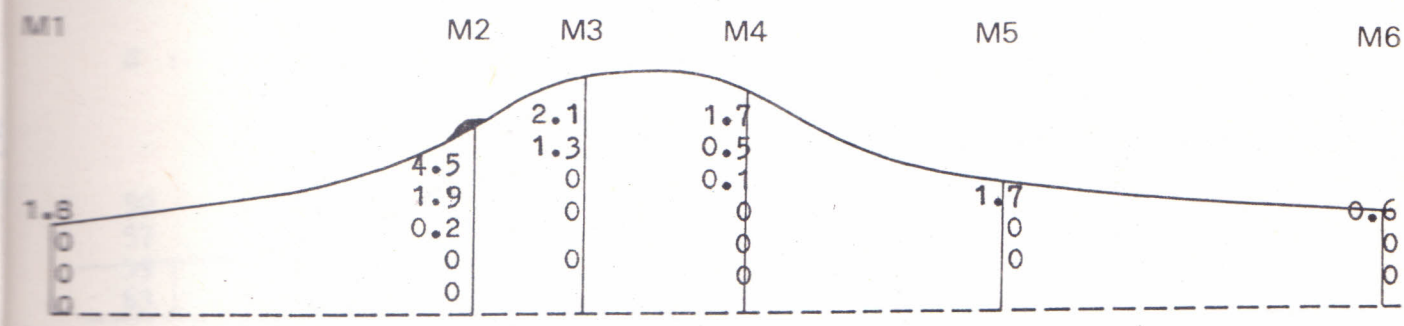


Figure 6 Termite mound : soil property distributions

(iv) exchangeable Al (me/100g)



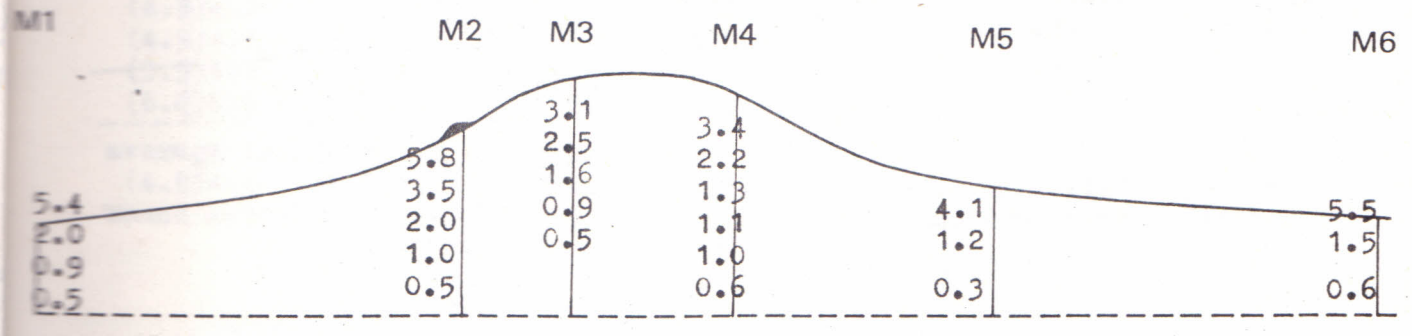
average (surface: A horizons)

M1	M2	M3	M4	M5	M6
0.9	3.2	1.7	0.8	1.7	0.6

mound average (M2+M3+M4) 1.9

non mound average (M1+M5+M6) 1.1

(iii) % organic matter



average (surface: A horizons)

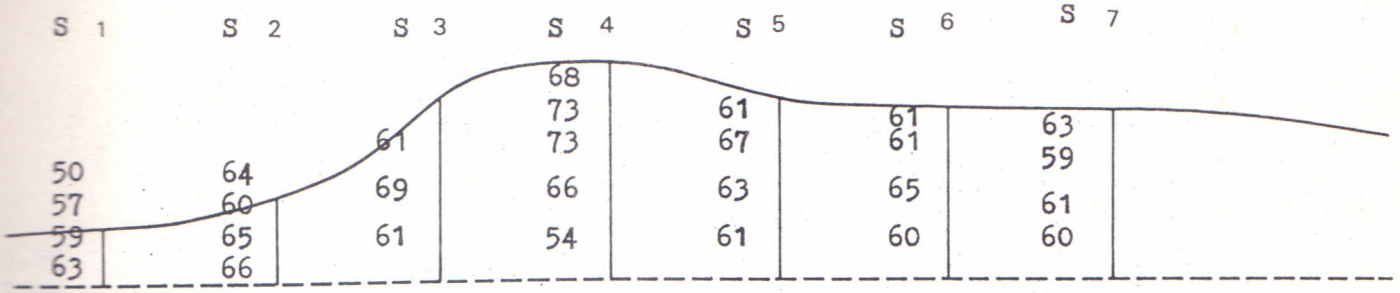
M1	M2	M3	M4	M5	M6
3.7	4.7	2.8	0.6	4.1	5.5

mound average (M2+M3+M4) 3.3

non-mound average (M1+M5+M6) 4.4

Figure 6 Non-termite mound : soil property distributions

(i) % clay

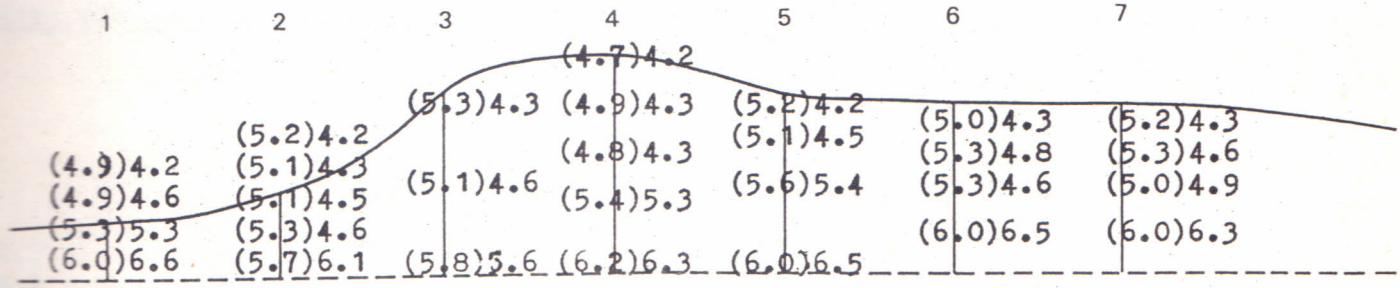


average (surface : A horizons)

54 62 65 71 64 61 61

Mound average (S3+S4+S5)=66.7 Non-mound average= 59.5

(ii) pH (H_2O) N KCl



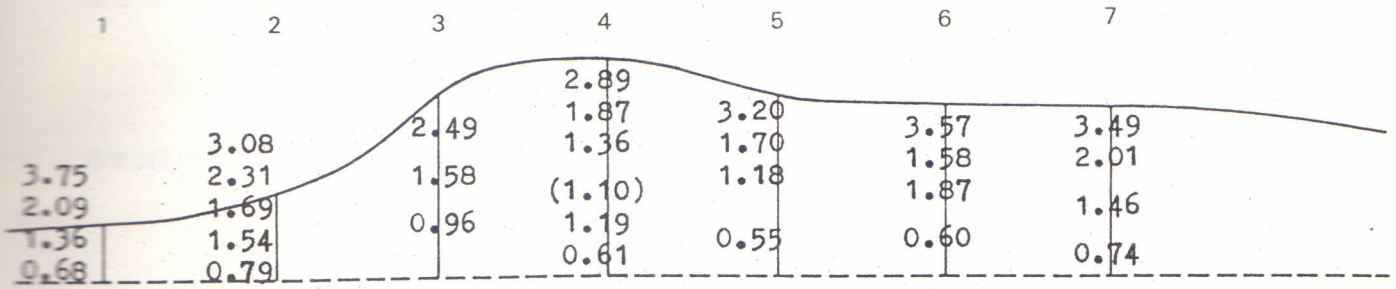
average (surface : A horizons)

(4.9)4.4 (5.2)4.3 (5.2)4.5 (4.8)4.3 (5.2)4.4 (5.2)4.6 (5.3)4.5

Mound average (S3+S4+S5)= (5.1)4.4 Non-mound average=(5.2)4.5

Figure 6 Non-termite mound : soil property distributions

(iii) % organic carbon

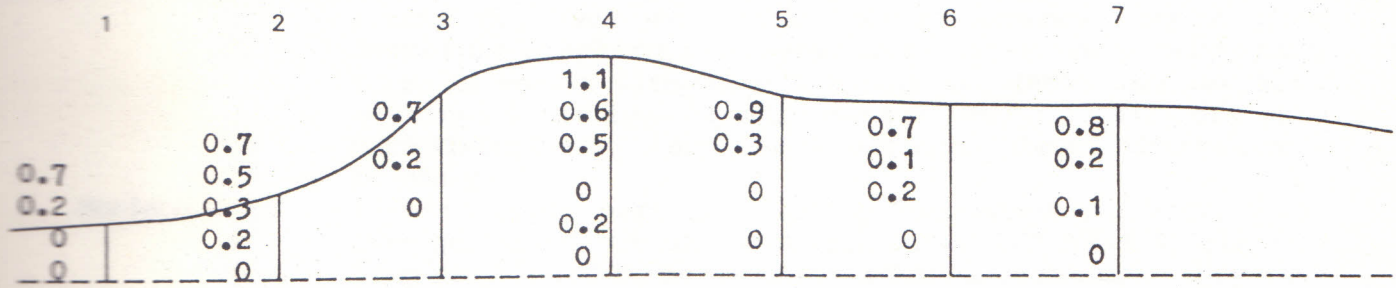


average (surface: A horizons)

2.92	2.70	2.03	2.04	2.45	2.58	2.75

Mound average (S3+S4+S5)= 2.17 Non-mound average= 2.73

(iv) exchangeable Al (mE/100g)



average (surface: A horizon)

0.5	0.6	0.5	0.7	0.6	0.4	0.5

Mound average (S3+S4+S5)= 0.6 Non-mound average= 0.5

Table 2: Soil profile descriptions: termite mound traverse

MUR 1 - Hydromorphic Soil: ground water gley with plinthitic B3g

Horizon 1 (A_1) 2-3mm grass litter overlying 0-5cm brownish black (10 YR 2/2), slightly gritty clay loam, moderate granular structure, many very small pores, dry smooth consistency, thick root mat, horizontal abrupt boundary

Horizon 2 (A_2) 6-28cm, dull yellow orange (10 YR 6/3) with fingers of brownish black (10 YR 2/2) slightly gritty clay, moderate subangular blocky structure, small pores common, damp friable consistency, fine root network, horizontal clear boundary

Horizon 3 (B_2) 29-50cm greyish yellow (2.5 Y 7/2) with bright yellowish brown in root channels (2.5 Y 6/8), slightly gritty clay, moderate angular blocky structure, small pores common with fractures and root holes, damp friable consistency, medium roots visible, horizontal clear boundary

Horizon 4 (B3g) 51-70^{+}cm dull yellow orange matrix (10 YR 7/3) with 30-40% reddish brown mottles (2.5 YR 4/8) and bright yellowish brown root channel infillings (2.5 Y 6/8), slightly gritty clay, moderate massive structure breaking to angular blocks >50mm epsd, small pores common with old root channels, lustrous compression surfaces, wet plastic consistency, some nodular cementation evident, occasional to rare roots, ground water within a few cm

MUR 2 - (Termite affected) Red-Yellow Latosol

Horizon 1 ('A_1') 10-15cm of Armitermes mound with some Cuvitermes activity 0-44cm brownish grey to black (7.5 YR 3/1-4/1), slightly gritty clay loam (very dry and partly hardened), strong block structure breaking into spheroidal faces, many very small pores in matrix with many large and very large termite voids, coatings (? saliva, organic matter) on void wall, dry very hard consistency, very few fine roots, abrupt discontinuous boundary

Horizon 2 ('A') 45-64cm upper part occupied by Synotermes galleries, lower part galleried but not occupied, brown (7.5 YR 4/4) slightly damp clay loam, moderate large granular structure, many very small pores in the matrix with common very large tubular gallery voids, coatings, damp and friable, medium and fine roots plus cut grass accumulations, horizontal clear boundary

Horizon 3 ('B_2') 65-80cm bright brown (7.5 YR 5/6-5/8), damp clay loam, weak laminar to blocky structure varying in size, few very small pores, damp friable consistency, medium roots common, horizontal gradual boundary

Horizon 4 ('B_3') 81-106cm, dull yellow orange (10 YR 6/3) with streaks of yellowish brown (10 YR 5/6), wet slightly gritty clay, weak angular blocky to granular structure {varied sizes mostly 5-10mm epsd}, few very small pores, wet lustrous pressure surfaces, wet plastic sticky consistency, occasional roots, horizontal gradual boundary

Horizon 5 ('B3g') 107-148^{+}cm, dull yellow orange matrix (10 YR 7/4) with 15% mottles at top increasing to over 50% into depth, bright brown (7.5 YR 5/8) and reddish brown (2.5 YR 4/8), wet gritty clay, weak but angular blocky structure {mainly 10-20mm epsd}, no visible pores, wet pressure surfaces, wet plastic very sticky consistency, rare roots.

MUR3 - (Termite affected) Red-Yellow Latosol with gleyed lower horizons

Horizon 1 ('A) base mound summit over 55cm active Sinotermes galleries (dry) and 18cm less active galleries (damp)
0-73cm greyish yellow brown (dry) (10 YR 4/2) and brown (damp) (10 YR 4/4), (?) sandy clay loam, strong granular (5-10mm) to angular blocky (2-5^{+}cm) structure, many very small pores in matrix with very large lateral tube and gallery voids, very hard (dry) to friable (damp) consistency, very few fine roots in upper section into fine and medium roots and cut grass accumulations in lower section, clear very irregular boundary

Horizon 2 ('B_2') 74-98cm bright brown (10 YR 4/2) with conical incursions of 'A' horizon material, slightly damp clay loam, moderate very large laminar to very large subangular blocky structure, very small/small pores common, damp friable consistency, fine and medium roots common and termite activity evident to 100cm, horizontal gradual boundary

Horizon 3 ('B_3) 99-140cm dull yellow orange to yellowish brown matrix (10 YR 6/4-5/6) with bright brown streaks (10 YR 5/8), damp sandy clay, weak very large angular blocky to massive structure, very small to small pores common, wet compression surfaces, wet lightly plastic and sticky consistency, occasional roots, horizontal gradual boundary

Horizon 4 ('B3g') 141-166^{+}cm dull yellow orange matrix (10 YR 7/4) with 15% reddish brown (2.5 YR 4/8) mottles in upper section increasing to over 40% with depth, wet slightly gritty clay, weak massive to slightly angular blocky structure, small pores, wet compression surfaces, wet plastic and very sticky consistency, very rare roots, ground water around 166cm

MUR 4 - (Termite affected) Red-Yellow Latosol with gleyed lower horizons

Horizon 1 ('A_2') Slight grass litter over 0-20cm active Sinotermes galleries, dark brown (10 YR 3/3), damp clay loam, moderate granular to very large sub angular blocky structure, many very small pores, dry hard consistency, fine and medium roots common, abrupt sloping and sinuous boundary

Horizon 2 ('A_2') 21-52 less active termite galleries, brown (10 YR 4/4), damp clay loam, moderate granular to very large subangular blocky structure, many very small pores, damp friable, fine and occasionally medium roots, horizontal gradual boundary

Horizon 3 ('A_3') 53-74cm slight termite activity, yellowish brown (10 YR 5/6), slightly gritty clay, weak very large angular blocks fracturing to granular structure, very small pores common, damp very friable consistency, occasional fine roots, abrupt horizontal boundary

Horizon 4 ('B_2') 75-93cm bright brown (7.5 YR 5/6-5/8), slightly gritty clay, weak massive angular blocks fracturing to granular aggregates, small pores common with (animal drill?) holes 1-2mm diameter, damp friable consistency, occasional roots, gradual horizontal to undulating boundary

Horizon 5 ('B_3') 94-115cm dull yellow orange matrix (10 YR 7/3-6/4) with a few orange mottles (7.5 YR 5/8), damp slightly gritty clay, weak massive structure, small pores common with (?drill) holes 1-2mm diameter, wet compression surfaces, wet plastic and sticky consistency, occasional roots, clear horizontal boundary

Horizon 6 ('B3g') 116-133$_+$cm dull yellow orange matrix (10 YR 7/3) with 30% mottles (rising to 50% in patches) bright brown (7.5 YR 5/8) and reddish brown (2.5 YR 4/8), slightly gritty clay, weak massive structure, small pores common with (?drill) holes 1-2mm diameter, wet compression surfaces, wet plastic and very sticky consistency, rare roots, ground water around 133cm

MUR 5 - Hydromorphic soil: ground water gley with plinthitic B3g

Horizon 1 (A_1) slight grass litter over 0-15cm brownish black, slightly gritty clay loam, moderate granular to subangular blocky structure, many very small pores, dry slightly hard consistency, medium and fine roots common, little evidence of termite galleries

Horizon 2 (B_2) 16-72cm conical incursions of A_1 material in upper 2cm, dull yellow orange (10 YR 6/3), gritty clay, weak massive structure fracturing to subangular blocky (>50mm epsd), many very small pores and small (?drill) holes, damp friable consistency, occasional medium roots, gradual horizontal boundary

Horizon 3 (B3g) 73-100_+cm light gray matrix (10 YR 8/2) with 15% to 75% mottled, bright yellowish brown (10 YR 6/8) and reddish brown (2.5 YR 4/8), gritty clay with mottles forming firm nodules, weak massive sub angular blocky structure, small pores common with (?drill) holes, wet compression surfaces, wet slightly plastic and very sticky consistency, rare roots

MUR 6 - Hydromorphic soil: ground water gley with plinthitic B2g

Horizon 1 (A_1) <3mm grass litter over 0-24cm brownish black (10 YR 3/1), clay loam, moderate granular structure, many very small pores, root mat and abundant fine roots, abrupt slightly sinuous boundary

Horizon 2 (B_{2i}) 25-40cm, dull yellow orange (10 YR 6/3), slightly gritty clay, moderate massive structure fracturing to subangular blocky aggregates {>50mm epsd}, many small pores, medium and fine roots common, diffuse horizontal boundary

Horizon 3 (B_{2ii}-B2g) 41-74cm, light grey matrix (10 YR 7/1) with yellow orange channels (10 YR 7/8) and slight mottling (10%), gritty and sandy clay, weak massive structure, no visible pores, wet compression surfaces, weak cementation evident in mottles ('sheets' of conchoidial polygonal cups - Fe?), ground water at approximately 74cm

Table 3 : Soil analyses : termite mound transect

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
MUR 1-1	0-5		10,5	89,5	15	7	25	53	28	47	0,47			
MUR 1-2	6-28		2,1	97,9	17	6	16	61	0	100	0,26			
MUR 1-3	29-50		5,2	94,8	11	5	18	66	0	100	0,27			
MUR 1-4	51-70		9,5	90,5	10	5	16	69	5	93	0,23			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,8	4,1	0,2	0,14	0,04	0,4	1,8	14,7	16,9	2	82	<0,5
	5,2	4,9	0,1	0,02	0,01	0,1	0	5,2	5,3	2	0	<0,5
	5,7	6,1	0,1	0,01	0,01	0,1	0	1,9	2,0	5	0	
	6,1	6,7	0,1	0,01	0,01	0,1	0	0,1	0,2	50	0	

Horizonte	C (orgânico) %	N %	C / N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0,8%)	SiO 2 / Al 2 O 3 (Ki)	Si O 2 / R 2 O 3 (Kr)	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de CaC O 3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	5,37	0,44	12	5,7	29,6	4,8	0,93			0,33	0,30	9,67		
	1,96	0,19	10	4,4	32,7	5,2	0,96			0,23	0,21	9,86		
	0,90	0,16	6	4,3	33,4	3,6	0,79			0,22	0,20	14,56		
	0,53	0,08	7	4,7	32,8	12,0	0,90			0,24	0,20	4,29		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				m e q / 100g de TF										
	<1													28,7
	<1													30,3
	1													32,9
	5													31,3

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm				Aparente	Real	
MUR 2-1	0-44		4,1	95,9	14	5	25	56	13	77	0,45			
MUR 2-2	45-64		1,2	98,8	8	5	21	66	20	70	0,32			
MUR 2-3	65-80		0,6	99,4	10	5	23	62	32	48	0,37			
MUR 2-4	81-106		3,9	96,1	17	6	12	65	13	80	0,18			
MUR 2-5	107-148		4,7	95,3	11	5	14	70	24	66	0,20			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	3,9	3,6	0,6	0,38	0,03	1,0	4,5	20,5	26,0	4	82	<0,5
	3,8	4,0	0,1	0,07	0,02	0,2	1,9	13,0	15,1	1	90	<0,5
	5,1	4,7	0,1	0,01	0,01	0,1	0,2	7,4	7,7	1	67	<0,5
	5,4	5,2	0,1	0,01	0,01	0,1	0	3,6	3,7	3	0	<0,5
	5,9	6,6	0,1	0,01	0,01	0,1	0	0,8	0,9	11	0	

Horizonte	C (orgânico) %	N %	C / N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0,8%)	SiO2 / Al2O3 (Ki)	Si O2 / R2O3 (Kr)	Al2O3 / Fe2O3	Fe2O3 livre %	Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	5,83	0,46	13	16,2	30,4	5,2	0,84			0,91	0,82	9,17		
	3,48	0,31	11	15,2	33,2	5,8	0,86			0,78	0,70	8,97		
	1,96	0,19	10	5,6	31,5	9,4	0,79			0,30	0,25	5,25		
	1,02	0,11	9	4,4	32,1	5,6	0,85			0,23	0,21	8,99		
	0,50	0,07	7	4,3	32,8	9,0	0,86			0,22	0,19	5,71		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				m e q / 100g de TF										
	<1													28,3
	<1													34,1
	<1													34,4
	<1													30,4
	1													31,8

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
MUR 3-1	0-55		1,1	98,9	9	6	25	60	37	38	0,42			
MUR 3-2	56-73		1,3	98,7	9	6	21	64	39	39	0,33			
MUR 3-3	74-98		1,0	99,0	12	6	31	51	35	31	0,61			
MUR 3-4	99-140		3,7	96,3	16	6	19	59	0	100	0,32			
MUR 3-5	141-166		4,4	95,6	13	5	17	65	22	66	0,26			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,0	3,9	0,1	0,12	0,01	0,2	2,1	12,8	15,1	1	91	< 0,5
	4,0	4,1	0,1	0,03	0,01	0,1	1,3	10,4	11,8	1	93	< 0,5
	5,2	5,1	0,1	0,02	0,01	0,1	0	5,2	5,3	2	0	< 0,5
	5,6	5,7	0,1	0,02	0,01	0,1	0	2,6	2,7	4	0	
	6,0	7,0	0,1	0,02	0,02	0,1	0	0,3	0,4	25	0	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						ATAQUE POR NaOH (0,8%) SiO2 / Al2O3 (Ki)	SiO2 / R2O3 (Kr)	Al2O3 / Fe2O3	Fe2O3 livre %	Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	3,06	0,25	12	4,7	30,5	5,4	0,78			0,26	0,22	8,85		
	2,50	0,21	12	8,0	32,0	5,8	0,87			0,42	0,38	8,64		
	1,58	0,14	11	6,1	32,0	11,5	0,84			0,32	0,26	4,36		
	0,92	0,11	8	4,3	32,4	5,8	0,94			0,23	0,20	8,75		
	0,47	0,06	8	4,2	32,6	10,6	1,01			0,22	0,18	4,82		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) meq / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl −	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
	< 1													32,9
	< 1													34,7
	< 1													37,4
	< 1													33,5
	5													33,6

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila <0,002 mm			% Argila	Aparente	Real	
MUR 4-1	0-20		2,0	98.0	7	6	22	65	24	63	0,34			
MUR 4-2	21-52		1,0	99,0	9	6	17	68	39	43	0,25			
MUR 4-3	53-74		1,2	98,8	8	5	17	70	41	41	0,24			
MUR 4-4	75-93		4,4	95,6	9	6	24	61	30	51	0,39			
MUR 4-5	94-115		3,0	97,0	13	6	20	61	1	98	0,33			
MUR 4-6	116-133		2,7	97,3	14	7	21	58	0	100	0,36			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\,Al^{+++}}{S + Al^{+++}}$	P assimilável ppm
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4,6	4,1	0,2	0,12	0,01	0,3	1,7	12,3	14,3	2	85	<0,
	4,8	4,3	0,1	0,03	0,01	0,1	0,5	8,2	8,8	1	83	<0,
	5,0	4,8	0,1	0,02	0,02	0,1	0,1	5,1	5,3	2	50	<0,
	5,4	5,5	0,1	0,02	0,02	0,1	0	3,3	3,4	3	0	<0,
	5,5	5,6	0,1	0,02	0,01	0,1	0	3,2	3,3	3	0	<0,
	5,8	6,4	0,1	0,02	0,01	0,1	0	1,3	1,4	7	0	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H_2SO_4 (1:1)					NaOH (0,8%)	$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{SiO_2}{R_2O_3}$ (Kr)	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
	3,36	0,28	12	7,3	33,0	5,4	0,97			0,38	0,34	9,57		
	2,21	0,20	11	5,4	34,3	5,9	0,99			0,27	0,24	9,11		
	1,33	0,13	10	5,3	35,8	6,3	1,00			0,25	0,23	8,91		
	1,13	0,12	9	5,1	35,0	9,0	1,05			0,25	0,21	6,09		
	1,03	0,10	10	4,8	34,4	7,4	1,03			0,24	0,21	7,29		
	0,60	0,07	9	4,9	36,4	7,4	0,96			0,23	0,20	7,71		

Horizonte	$\frac{100\,Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				m e q / 100g de TF										
	<1													31,5
	<1													35,1
	<1													36,0
	<1													35,8
	<1													35,4
	1													34,9

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm				Aparente	Real	
MUR 5-1	0-15		1,0	99,0	12	7	25	56	36	36	0,45			
MUR 5-2	16-72		2,2	97,8	11	7	21	61	1	98	0,34			
MUR 5-3	73-100		5,0	95,0	10	5	18	67	6	91	0,27			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,5	4,0	0,2	0,14	0,01	0,4	1,7	13,2	15,3	3	81	<0,5
	5,3	5,5	0,1	0,03	0,01	0,1	0	4,1	4,2	2	0	<0,5
	6,0	6,9	0,1	0,02	0,01	0,1	0	0,5	0,6	17	0	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1) e Na OH (0,8%)						SiO2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de CaC O3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	4,05	0,31	13	6,1	33,0	4,9	0,87			0,31	0,29	10,57		
	1,15	0,11	10	4,8	34,9	5,1	0,95			0,23	0,21	10,73		
	0,34	0,07	5	4,8	35,3	6,5	0,96			0,23	0,21	8,52		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
	<1													31,9
	<1													35,6
	2													35,4

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
MUR 6-1	0-24		1,3	98,7	10	7	26	57	33	42	0,46			
MUR 6-2	25-40		2,8	97,2	16	7	13	64	45	30	0,20			
MUR 6-3	41-74		4,9	95,1	9	4	15	72	0	100	0,21			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	Assimilável
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	5,6	4,3	0,1	0,10	0,01	0,2	0,6	12,6	13,4	1	75	<0,
	5,1	4,8	0,1	0,03	0,01	0,1	0	5,1	5,2	2	0	<0,
	5,9	6,5	0,1	0,02	0,01	0,1	0	1,1	1,2	8	0	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						NaOH (0.8%) SiO2 / Al2 O3 (Ki)	Si O2 / R 2 O3 (Kr)	Al 2 O 3 / Fe 2 O 3	Fe2 O3 livre %	Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O3	Ti O 2	P 2 O 5	MnO					
	5,52	0,44	13	5,4	35,2	3,7	0,88			0,36	0,33	10,70		
	1,52	0,15	10	4,3	33,9	4,7	0,86			0,22	0,20	11,31		
	0,58	0,09	6	5,2	37,7	3,0	1,03			0,23	0,22	19,66		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				m e q / 100g de TF										
	<1													35,2
	<1													29,0
	1													37,8

Table 4: Soil profile descriptions: non-termite mound

Profile/Section No 1: Red-yellow latosol with ground water gley and plinthitic B2g

Horizon 1 (A1) 0-10cm, greyish yellow brown (10 YR 4/2), silty loam, very small to small granular to subangular blocky structure, many small pores, dry smooth consistency, level clear boundary

Horizon 2 (A_2) 16-24cm, dull yellow (2.5 Y 6/4), silty clay loam, moderate small subangular blocky structure, frequent small pores, friable, undulating, diffuse boundary

Horizon 3 (B_{2i}) 25-37cm, dull yellow orange (10 YR 7/4) with a few small yellow orange mottles (10 YR 7/8), silty clay, small subangular blocky structure, many small pores, friable, level, diffuse boundary

Horizon 4 (B_{2iig}) 38-52cm, dull yellow orange (10 YR 7/3) with abundant, medium distinct orange mottles (7.5 YR 6/8) and frequent medium distinct reddish brown mottles (2.5 YR 4/6), silty clay loam, small subangular blocky structure, many small pores, friable.

Ground water at 95cm

Observations Horizons 1 and 2 had characteristics of Red-Yellow Latosol
Horizons 3 and 4 had characteristics of Hydromorphic Laterite

Profile/Section 4: Red-Yellow Latosol

Horizon 1 (A_3) 0-20cm, dull yellowish brown (10 YR 4/3-5/4), silty clay loam, moderate small to very large subangular blocky, many small pores, friable, active ants and termites, undulating, gradual boundary

Horizon 2 (B_{2i}) 21-85cm, dull yellowish brown (10 YR 5/4), silty clay, moderate, medium subangular blocky structure, many very small pores, moderate ant and termite activity, clear boundary

Horizon 3 (B_{2ii}) 86-120cm, yellow orange (10 YR 7/8) to bright brown (7.5 YR 5/8), a few diffuse maroon coloured mottles, silty clay, small to medium subangular blocky structure, few to numerous pores, very friable, abrupt transition 100cm, patch of dull brown mineral soil (7.5 YR 5/3) similar to Horizon 1

Horizon 4 (C) 121cm$_+$ pale yellow matrix (2.5 Y 8/3) with mottles - dull yellow orange (10 YR 6/4) to dull orange (2.5 YR 6/4), clay, medium subangular blocky, many very small pores, friable

Table 5 Soil analyses: non termite mound transect

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH Calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm³		Porosidade % (volume)
Símbolo	Profundidade cm	Calhau > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2-0,20 mm	Areia fina 0,20-0,05 mm	Silte 0,05-0,002 mm	Argila < 0,002 mm				Aparente	Real	
S1-1	0-10				28	7	15	50	18	64	0.30			
S1-2	11-24				20	8	15	57	27	53	0.26			
S1-3	25-37				17	6	18	59	1	98	0.31			
S1-4	38-52				14	7	16	63	5	92	0.25			

Horizonte	pH (1:2,5)		Complexo sortivo mE/100g								Valor V (sat. de bases) %	$\frac{100.\ Al^{+++}}{Al^{+++}+S}$	P. assimilável ppm
	Água	KCl 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4.9	4.2	0.	4	0.10	0.02	0.5	0.7	8.7	9.9	5	58	< 1
	4.9	4.6	0.	4	0.04	0.01	0.5	0.2	5.5	6.2	8	29	< 1
	5.3	5.3	0.	1	0.02	0.01	0.1	0	3.3	3.4	3	0	< 1
	6.0	6.6	0.	3	0.01	0.01	0.3	0	1.5	1.8	17	0	< 1

Horizonte cm	C (orgânico) %	N %	C/N	Ataque por H_2SO_4 d = 1,47 %						$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{SiO_2}{R_2O_3}$ (Kr)	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
0-10	3.75	0.25	15	5.0	36.4	5.5	0.75			0.23	0.21	10.38		
11-24	2.09	0.17	12											
25-37	1.36	0.11	12											
38-52	0.68	0.06	11	3.6	46.3	7.6	0.89			0.13	0.12	9.56		

Horizonte	Sat. c/sódio (% de Na^+ trocável no valor T)	Pasta saturada		Sais solúveis (extrtao 1:5)							Constantes hídricas %			
		C. E. do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^+	Na^+	$HCO_3^- - CO_3^=$	Cl^-	$SO_4^=$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← mE/100g →										
	< 1													29
	< 1													31
	< 1													30
	1													30

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH Calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm³		Porosidade % (volume)
Símbolo	Profundidade cm	Calhau > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2-0,20 mm	Areia fina 0,20-0,05 mm	Silte 0,05-0,002 mm	Argila < 0,002 mm				Aparente	Real	
S2-1	0-10				12	8	16	64	30	53	0.25			
S2-2	11-15				12	7	21	60	37	38	0.35			
S2-3	16-20				14	6	15	65	28	57	0.23			
S2-4	21-37				15	7	12	66	32	52	0.18			
S2-5	38-70													

Horizonte	pH (1:2,5)		Complexo sortivo mE/100g								Valor V (sat. de bases) %	$\frac{100.\ Al^{+++}}{Al^{+++} + S}$	P. assimilável ppm
	Agua	KCl 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	5.2	4.2	0.	4	0.07	0.03	0.5	0.7	10.5	11.7	4	58	<1
	5.1	4.3	0.	2	0.04	0.02	0.3	0.5	8.2	9.0	3	63	<1
	5.1	4.5	0.	1	0.02	0.01	0.1	0.3	6.7	7.1	1	75	<1
	5.3	4.6	0.	1	0.01	0.01	0.1	0.2	5.9	6.2	2	67	<1
	5.7	6.1	0.	3	0.01	0.01	0.3	0	2.1	2.4	13	0	<1

Horizonte cm	C (orgânico) %	N %	C/N	Ataque por H_2SO_4 d = 1,47 %						$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{SiO_2}{R_2O_3}$ (Kr)	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
0-10	3.08	0.24	13	5.7	40.6	5.7	0.83			0.24	0.22	11.18		
11-15	2.31	0.19	12											
16-20	1.69	0.14	12											
21-37	1.54	0.12	13											
38-70	0.79	0.07	11	3.8	45.8	5.7	0.90			0.14	0.13	12.61		

Horizonte	Sat. c/sódio (% de Na+ trocável no valor T)	Pasta saturada		Sais solúveis (extrtao 1:5)							Constantes hídricas %			
		C. E. do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^+	Na^+	$HCO_3^- - CO_3^=$	Cl^-	$SO_4^=$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← mE/100g →										
	<1													33
	<1													33
	<1													33
	<1													33
	<1													31
	<1													

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH Calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm³		Porosidade % (volume
Símbolo	Profundidade cm	Calhau > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2-0,20 mm	Areia fina 0,20-0,05 mm	Silte 0,05-0,002 mm	Argila < 0,002 mm				Aparente	Real	
S3-1	0-27				11	7	21	61	30	51	0.34			
S3-2	28-112				10	6	15	69	27	61	0.22			
S3-3	112-129				19	6	14	61	0	100	0.23			

Horizonte	pH (1:2,5)		Complexo sortivo mE/100g								Valor V (sat. de bases) %	$\frac{100.\ Al^{+++}}{Al^{+++}+S}$	P. assimilável ppm
	Agua	KCl 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	5.3	4.3	0	2	0.05	0.01	0.3	0.7	9.5	10.5	3	70	< 1
	5.1	4.6	0	1	0.01	0.01	0.1	0.2	6.3	6.6	2	67	< 1
	5.8	5.6	0	1	0.01	0.01	0.1	0	2.3	2.4	4	0	1

Horizonte cm	C (orgânico) %	N %	C/N	Ataque por H_2SO_4 d = 1,47 %						$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{SiO_2}{R_2O_3}$ (Kr)	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
0-27	2.49	0.19	13	5.6	41.9	5.9	0.81			0.23	0.21	11.13		
28-112	1.58	0.12	13											
112-129	0.96	0.08	12	4.3	44.9	5.8	0.94			0.16	0.15	12.13		

Horizonte	Sat. c/sódio (% de Na+ trocável no valor T)	Pasta saturada		Sais solúveis (extrtao 1:5)							Constantes hídricas %			
		C. E. do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^+	Na^+	$HCO_3^- CO_3^=$	Cl^-	$SO_4^=$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← mE/100g →										
	< 1													32
	< 1													33
	< 1													29

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH Calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm³		Porosidade % (volume)
Símbolo	Profundidade cm	Calhau > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2-0,20 mm	Areia fina 0,20-0,05 mm	Silte 0,05-0,002 mm	Argila < 0,002 mm				Aparente	Real	
S4-1	0-10				8	7	17	68	24	65	0.25			
S4-2	11-20				6	5	16	73	38	48	0.22			
S4-3	21-85				8	6	13	73	29	60	0.18			
S4-4	86-120				14	6	14	66	3	95	0.21			
S4-5	c.100				11	5	14	70	26	63	0.20			
S4-6	121-150				15	7	24	54	4	93	0.44			

Horizonte	pH (1:2,5)		Complexo sortivo mE/100g								Valor V (sat. de bases) %	$\frac{100.\ Al^{+++}}{Al^{+++}+S}$	P. assimilável ppm
	Água	KCl 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4.7	4.2	0.2	0.06	0.03	0.3	1.1	10.0	10.4	3	79	< 1	
	4.9	4.3	0.1	0.02	0.01	0.1	0.6	7.9	8.6	1	86	< 1	
	4.8	4.3	0.1	0.01	0.01	0.1	0.5	5.9	6.5	2	83	< 1	
	5.4	5.3	0.2	0.01	0.01	0.2	0	4.0	4.2	5	0	< 1	
	5.2	4.7	0.3	0.01	0.01	0.3	0.2	5.1	5.6	5	40	< 1	
	6.2	6.3	0.1	0.01	0.02	0.1	0	1.0	1.1	9	0	< 1	

Horizonte	C (orgânico) %	N %	C/N	Ataque por H_2SO_4 d = 1,47 %						$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{SiO_2}{R_2O_3}$ (Kr)	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
0-10	2.89	0.22	13	5.9	41.8	5.9	0.85			0.24	0.22	11.11		
11-20	1.87	0.14	13											
21-85	1.36	0.10	14											
86-120	1.10	0.08	14											
c.100	1.19	0.08	15											
121-150	0.61	0.06	10	3.7	46.4	6.1	1.00			0.14	0.13	11.94		

Horizonte	Sat. c/sódio (% de Na^+ trocável no valor T)	Pasta saturada		Sais solúveis (extrtao 1:5)							Constantes hídricas %			
		C. E. do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^+	Na^+	$HCO_3^- CO_3^=$	Cl^-	$SO_4^=$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← mE/100g →										
	< 1													34
	< 1													33
	< 1													32
	< 1													29
	< 1													31
	1													33

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH Calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm³		Porosidade % (volume)
Símbolo	Profundidade cm	Calhau > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2-0,20 mm	Areia fina 0,20-0,05 mm	Silte 0,05-0,002 mm	Argila < 0,002 mm				Aparente	Real	
S5-1	0-10				12	7	20	61	14	77	0.33			
S5-2	11-30				11	6	16	67	22	67	0.24			
S5-3	31-55				15	6	16	63	6	90	0.25			
S5-4	56-87				14	5	20	61	8	87	0.33			

Horizonte	pH (1:2,5)		Complexo sortivo mE/100g								Valor V (sat. de bases) %	$\frac{100.\ Al^{+++}}{Al^{+++}+S}$	P. assimilável ppm
	Água	KCl 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	5.2	4.2	0. 1		0.09	0.03	0.2	0.9	9.8	10.9	2	82	< 1
	5.1	4.5	0. 2		0.03	0.01	0.2	0.3	6.0	6.5	3	60	< 1
	5.6	5.4	0. 1		0.01	0.01	0.1	0	3.8	3.9	3	0	< 1
	6.0	6.5	0. 1		0.01	0.01	0.1	0	1.1	1.2	8	0	< 1

Horizonte cm	C (orgânico) %	N %	C/N	Ataque por H_2SO_4 d = 1,47 %						$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{SiO_2}{R_2O_3}$ (Kr)	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
0-10	3.12	0.24	13	5.6	40.2	5.4	0.79			0.24	0.22	11.66		
11-30	1.70	0.13	13											
31-55	1.18	0.09	13											
56-87	0.55	0.05	11	3.6	48.1	4.3	0.94			0.13	0.12	17.54		

Horizonte	Sat. c/sódio (% de Na^+ trocável no valor T)	Pasta saturada		Sais solúveis (extrtao 1:5)							Constantes hídricas %			
		C. E. do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^+	Na^+	$HCO_3^- CO_3^=$	Cl^-	$SO_4^=$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← mE/100g →										
	< 1													32
	< 1													32
	< 1													31
	< 1													35

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH Calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm³		Porosidade % (volume)
Símbolo	Profundidade cm	Calhau > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2-0,20 mm	Areia fina 0,20-0,05 mm	Silte 0,05-0,002 mm	Argila < 0,002 mm				Aparente	Real	
S6-1	0-10				10	7	22	61	25	59	0.36			
S6-2	11-22				16	7	16	61	40	34	0.26			
S6-3	23-38				11	7	17	65	25	62	0.26			
S6-4	39-86				20	7	13	60	1	98	0.22			

Horizonte	pH (1:2,5)		Complexo sortivo mE/100g								Valor V (sat. de bases) %	$\frac{100.\ Al^{+++}}{Al^{+++}+S}$	P. assimilável ppm
	Água	KCl 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	5.0	4.3	0.	1	0.06	0.03	0.2	0.7	9.5	10.4	2	78	< 1
	5.3	4.8	0.	2	0.02	0.01	0.2	0.1	4.2	4.5	4	33	< 1
	5.3	4.6	0.	1	0.03	0.01	0.1	0.2	6.7	7.0	1	67	< 1
	6.0	6.5	0.	1	0.01	0.01	0.1	0	1.1	1.2	8	0	< 1

Horizonte cm	C (orgânico) %	N %	C/N	Ataque por H_2SO_4 d = 1,47 %						$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{SiO_2}{R_2O_3}$ (Kr)	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
0-10	3.57	0.28	13	5.5	40.8	5.1	0.86			0.23	0.21	12.54		
11-22	1.58	0.14	11											
23-38	1.87	0.17	11											
39-86	0.60	0.06	10	3.8	45.2	5.9	0.93			0.14	0.13	12.01		

Horizonte	Sat. c/sódio (% de Na^+ trocável no valor T)	Pasta saturada		Sais solúveis (extrtao 1:5)							Constantes hídricas %			
		C. E. do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^+	Na^+	$HCO_3^- CO_3^=$	Cl^-	$SO_4^=$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← mE/100g →										
	< 1													36
	< 1													28
	< 1													33
	1													32

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH Calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm³		Porosidade % (volume)
Símbolo	Profundidade cm	Calhau > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2-0,20 mm	Areia fina 0,20-0,05 mm	Silte 0,05-0,002 mm	Argila < 0,002 mm				Aparente	Real	
S7-1	0-11				8	7	22	63	25	60	0.35			
S7-2	12-24				12	7	22	59	33	44	0.37			
S7-3	25-39				20	7	12	61	26	57	0.20			
S7-4	40-87				17	7	16	60	1	98	0.27			

Horizonte	pH (1:2,5)		Complexo sortivo mE/100g								Valor V (sat. de bases) %	$\frac{100.\ Al^{+++}}{Al^{+++}+S}$	P. assimilável ppm
	Água	KCl 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	5.2	4.3	0.	1	0.05	0.03	0.2	0.8	9.4	10.4	2	80	<1
	5.3	4.6	0.	1	0.02	0.03	0.2	0.2	7.0	7.4	3	50	<1
	5.0	4.9	0.	2	0.01	0.01	0.2	0.1	4.7	5.0	4	33	<1
	6.0	6.3	0.	3	0.01	0.02	0.3	0	1.9	2.2	14	0	<1

Horizonte cm	C (orgânico) %	N %	C/N	Ataque por H_2SO_4 d = 1,47 %						$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{SiO_2}{R_2O_3}$ (Kr)	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
0-11	3.49	0.28	12	5.6	41.0	5.2	0.88			0.23	0.21	12.37		
12-24	2.01	0.17	12											
25-39	1.46	0.13	11											
40-87	0.74	0.07	11	3.8	44.8	4.9	0.85			0.14	0.13	14.35		

Horizonte	Sat. c/sódio (% de Na+ trocável no valor T)	Pasta saturada		Sais solúveis (extrtao 1:5)							Constantes hídricas %			
		C. E. do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^+	Na^+	$HCO_3^- CO_3^=$	Cl^-	$SO_4^=$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← mE/100g →										
	< 1													35
	< 1													32
	< 1													29
	1													30

Porosidade % (volume)	+++ / +S	P. assimilável ppm
		< 1
		< 1
		< 1
		< 1

Table 6a : Vegetation at the termite mound site

The vegetation description is grouped for the mound and non-mound sites. The mound sites correspond to the termite mound itself and to sites 7 and 10 of TLA. The wet grassland depressional sites correspond to the general area between sites 6 and 13 of TLA excluding mound sites.

Mound sites : Jacaranda caroba (Vell) dominant
Bombax tomentosum
Byrsonima sp
Connarus suberosus var fulvus
Dalbergia violacea
Davilla elliptica
Desmocelis villosa (Aubl)
Didymopanax macrocarpum
Erythroxylum campestre
Kielmeyera coriacea
Lafoensia pacari
Lycopodium eichleri
Miconia albicans
M. fallax
Maprounea guianensis
Pisonia tomentosa
Symplocos rhamnifolia (9m)

Intermound depressions : Xyris spp dominants
Rhynchospora spp
Eriocaulon sp
Andropogon spp

Apteria aphylla
Burmannia alba
B.flava
Chelonanthus viridiforus
Curtia patula
C.tenuifolia
C.verticillaris
Drosera hirtella
Lisianthus coerulescens
Lycopodium alopecuroides
L. carolinianum
Microlicia sp
Monnina sp
Paepalanthus spp
Polygala atropurpurea
P. juncea
P.linoides
Porophyllum spp
Sauvagesia racemosa
Schultesia spp
Sisyrhynchium incurvatum
Trimezia sp
Utricularia spp
Xyris spp

Table 6b: Vegetation at the non-termite mound site

Section 1 : Styrax ferrugineus (well drained sites)
Erythroxylum sp
Byrsonima sp (murici)
Miconia sp
Eremanthus sp (coracao de negro)
Myrcia sp
Didymopanax macrocarpum (mandiocao do cerrado)
Maprounea guianensis
Ouratea hexasperma (cabeca de negro)
Davilla elliptica (lixeirinha)
Dalbergia violacea (jacaranda preto)
Stryphnodendron adstringens (barbatimao)
Connarus suberosus var. fulvus
Protium heptaphyllum
Mimosa sp
Kielmeyera coriacea (pau-santo)
Himatanthus obovatus (pau-de-leite)
Paepalanthus speciosus (transitional site)
Paepalanthus sp (poorly drained sites)
Poligala sp
Bulbostylis paradoxa
Xyris sp
Bignoniacea (cipo amarelo)
Gramineae
Cyperaceae

Section 2 : Mimosa sp
Symplocos rhamnifolia
Kielmeyera coriacea
Verbenaceae
Xyris sp
Cyperaceae
Hyptis sp
Erythroxylum suberosum
Compositae
Echinolaena inflexa
Gramineae (95%)

Section 3 : Dalbergia violacea
Borreria sp
Erythroxylum suberosum
Stryphnodendron adstringens
Connarus suberosus var. fulvus
Palicourea rigida
Melastomataceae
Cassia sp
Myrtaceae
Gramineae
Echinolaena inflexa

Table 6b(continued)

Section 4 :	Gramineae
	Davilla elliptica
	Blepharocalyx suaveolens
	Unidentified tree (3.5m, o.8cm diam)
	Melastomaceae
	Erythroxylum suberosum
	Erythroxylum tortuosum
	Salacia crassifolia (bacupari)
	Eremanthus sp
	Cassia sp
	Borreria sp
	Verbenaceae
	Didymopanax macrocarpum
	Byrsonima crassa
Section 5 :	Melastomaceae
	Anacardium sp
	Myrcia sp
	Verbenaceae
	Cassia sp
	Hiptis sp (4 indiv.)
	Roupala montane
	Compositae
	Myrtaceae
Section 6 :	Paepalanthus speciosus
	Echinolaena inflexa
	Gramineae (over 95%)

2. Catenary studies at Córrego da Onça (TLA and TLB)

Two transects were established orthogonal to the slope in an area which well represented the plant communities of the cerrado and gallery forest. One (TLA) passed through the murundus field described earlier and formed half of the complete catenary study described in Freire (1979). The second (TLB) was located about a kilometre further downstream. Both extended from open woody savanna (campo cerrado) through shrubby and clear grassland (campo sujo and campo limpo) containing earthmound fields (campos de murundus) to gallery forest at the foot of the slope (mata ciliar). Figure 7.

Transect Line A (TLA)

A total of 23 profiles were located over a transect of nearly 400m. There was a greater intensity of profiles (10 to 20m intervals) over the lower slope and gallery forest and murundus field where changes resulting from topography and drainage were most pronounced. Profiles are numbered from the baseline of the transect (Corrego da Onca). Sites 1-5 lie within the gallery forest; 6-13 lie within the murundus area, some being located on the cerrado-covered mounds (7 and 10) whilst the remainder lie in wet grassy depressions (8, 9, 11, 12 and 13); sites 14 to 23 lie in open woody savanna. The soil profile descriptions and supporting analytical data are given in Freire (op.cit) and are consequently not repeated here.

Transect Line B (TLB)

A total of 26 profiles were located over a transect length of 590m with a greater intensity (10m intervals) over the lower slope where the most rapid changes were to be observed increasing to a wider interval of 20m over the midslope and the greatest interval (40m) over the uniform gently convex upper slope (Figure 7b). Profiles are numbered from the baseline at Córrego da Onça. Numbers 1 to 4 represent wet organic soils close to ground-water and within the gallery forest; number 5 lies at the edge of the gallery and, together with 6, reveal very gleyed organic profiles; numbers 7 and 8 represent a small patch of shrubby cerrado which passes upslope into an open cerrado (sites 9 to 16); numbers 17-22 occur in open grassland in which earthmounds of Type 2a are found; the upper part of the transect reverts to an open arboreal cerrado (numbers 23 to 26).

The soil profile descriptions are given in Table 7. Physical and chemical analyses are summarised in Table 8. The methods of analysis used in the determination of soil properties for both transects are noted in Table 9.

No further analysis, comment or interpretation is given here in this present edition. The transect material is being prepared for publication.

Figure 7

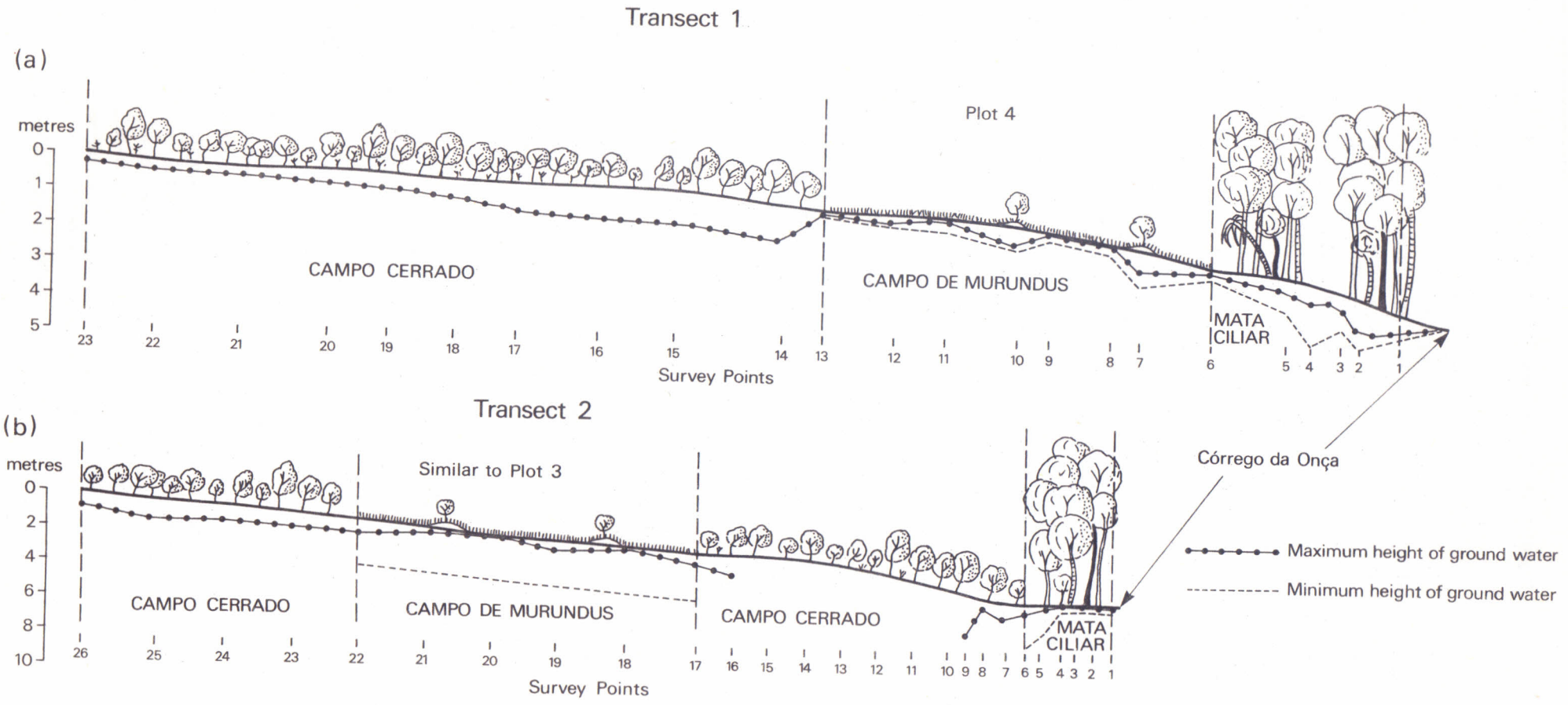

Transect 1
(a)
metres
0
1
2
3
4
5
Plot 4
CAMPO CERRADO
CAMPO DE MURUNDUS
MATA CILIAR
23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
Survey Points
Transect 2
(b)
metres
0
2
4
6
8
10
Similar to Plot 3
CAMPO CERRADO
CAMPO DE MURUNDUS
CAMPO CERRADO
MATA CILIAR
26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
Survey Points
Córrego da Onça
Maximum height of ground water
Minimum height of ground water

Table 7 : Soil profile descriptions : TLB (1-26)

TLB-1	: level, 2m from stream baseline, gallery forest
Surface	: 29-26cm leaf litter 26- 8cm fermentation layer 9- 0cm surface root mat
Horizon 1 (A1i)	: 0-18cm black (5 YR 1.7/1) silty clay, structuresless, many very very small pores, lustrous pressure surfaces, wet slightly plastic and sticky consistency, fine medium and large roots throughout, diffuse level boundary
Horizon 2 (A1ii)	: 19-25cm very wet black (5 YR 1.7/1); similar to A1i) 26cm ground water
TLB-2	: level site, gallery forest
Surface	: 14- 9cm leaf litter 9- 8cm fermentation layer 8- 0cm surface root mat
Horizon 1 (A1i)	: 0-12cm brownish black (5 YR 2/1) silty clay, weak moderately cohesive granular structure (< 5mm epsd), many very small pores, lustrous pressure surfaces, wet slightly plastic and sticky consistency, abundant fine medium and thick roots, diffuse level boundary
Horizon 2 (A1ii)	: 13-35cm very wet black (5 YR 1.7/1) silty clay, structuress, similar to (A1i) 36cm ground water
TLB-3	: level site, gallery forest with grass cover
Surface	: 12- 7cm leaf litter 7- 5cm fermentation layer 5-0cm surface root mat
Horizon 1 (A1i)	: 0-10cm brownish black (5 YR 2/2 silty clay, weak and weakly cohesive granular structure, lustrous pressure surfaces, many very small pores, slightly plastic sticky consistency, abundant fine frequent medium and occasional large roots, diffuse level boundary
Horizon 2 (A1ii)	: 11-34cm black (5 YR 1.7/1) silty clay, structureless, similar to (A1i) but very sticky 35cm ground water
TLB-4	: level, gallery forest with thick grass cover
Surface	: 13-10cm leaf litter 10- 0cm fermentation layer and surface root mat
Horizon 1 (A)	: 0-35 black (5 YR 1.7/1) silty clay, structureless, wet lustrous pressure surfaces, many very small pores, slightly plastic sticky consistency, abundant roots decreasing towards saturated layer 36cm ground water
TLB-5	: nearly level, gallery forest
Surface	: 5-3cm leaf litter 3-0cm surface root mat
Horizon 1 (A)	: 0-43cm black (7.5 YR 2/1) with reddish black inclusions of fermented organic matter, silty clay, moderately strong and cohesive granular structure(max 10-20mm epsd), many very small pores, dry slightly hard consistency, abundant roots, diffuse level boundary
Horizon 2 (B)	: 44-64cm brownish grey (7.5 YR 5/1) clay, structureless, pores not visible, lustrous compression surfaces, wet slightly plastic and very sticky consistency, frequent roots 65cm ground water

TLB-6 : gentle slope, transition gallery forest-campo sujo

Surface : 12-10cm leaf and fern litter
10- 0cm surface root mat

Horizon 1 (A) : 0-33cm brownish black to black (2.5 Y 3/1-2/1) silty clay, moderately strong and cohesive granular structure, many very small pores, dry slightly hard consistency, abundant fine and medium roots, abrupt clear irregular boundary

Horizon 2 (B1) : 33-42cm brownish black to brownish grey (7.5 YR 3/1-4/1) silty clay, moderately strong and cohesive angular blocks, small pores, lustrous compression surfaces, damp firm consistency, frequent roots, clear irregular boundary

Horizon 3 (B2/3) : 43-90cm light brownish grey (7.5 YR 7/2) with streaks of light yellow orange (7.5 YR 8/4) wet clay, structureless, small pores, lustrous compression surfaces, wet slightly plastic and very sticky consistency, very few roots, saturated at 91cm (?ground water)

TLB-7 : gentle slope a few metres above transition, campo sujo

Surface : <1cm grass litter

Horizon 1 : 0-20cm black (10 YR 2/1) clay loam, moderately strong and cohesive granular structure (<1mm epsd), many very small pores, dry smooth consistency, thick root mat with abundant fine and medium roots, abrupt level boundary with conical intrusions into Horizon 2

Horizon 2 (A2/3) : 21-27cm dull brown (7.5 YR 5/3) clay, strong and cohesive massive structure breaking to angular blocky (>5cm), frequent very small pores (mostly channels), dry hard consistency, occasional fine and medium roots, clear horizontal boundary

Horizon 3 (B2) : 28-30cm greyish brown (5 YR 4/2) clay, strong and cohesive massive structure breaking to angular blocky (>5cm), pores not visible but frequent very small channels, dry hard consistency, occasional medium roots, gradual horizontal boundary

Horizon 4 (B3) : 39-104cm light brownish grey (7.5 YR 7/1) clay, strong and cohesive massive structure breaking to angular blocky (>5cm), frequent very small channels, damp firm consistency, occasional medium roots, gradual horizontal boundary

Horizon 5 (?IIB) : 105-125cm brownish grey (7.5 YR 6/1) with yellow orange mottles (10 YR 7/8) , gravelly clay, subangular and sub rounded gravel in clay matrix, weak and weakly cohesive massive structure breaking into sub rounded fragments, frequent small channels and fractures, damp friable consistency, rare medium roots
126cm very wet but not ground water

TLB-8 : 1 metre below pronounced break of slope, campo cerrado

Horizon 1 (A1/2) : 0-30cm dull yellowish brown (10 YR 4/3) gritty sandy clay loam, moderately strong and cohesive granular structure, many very small pores,dry slightly hard consistency, abundant fine and medium roots, clear gradual horizontal boundary

Horizon 2 (B2) : 31-76cm bright yellowish brown (10 YR 6/8) gritty sandy clay, strong and cohesive granular (5-10mm) to sub angular blocky (20-50mm) structure, frequent small pores (voids), dry hard consistency, occasional fine and medium roots, clear horizontal boundary

Horizon 3 (?II) : 77-86cm bright yellowish brown matrix (10 YR 6/8) with dull reddish brown nodules (2.5 YR 4/4-4/6) with orange coatings (7.5 YR 6/8), thin matrix of gritty clay with solid stone layer 5-7cm thick, structureless compacted stone layer, many voids, dry friable, occasional medium roots, abrupt clear horizontal boundary

Horizon 4 (?III) : 87-130cm reddish brown (2.5 YR 4/8) gritty clay, structureless, no visible pores dry hard consistency, rare roots

TLB-9 : steep slope, campo cerrado

Horizon 1 (A) : <3mm grass and leaf litter
0-43cm dull yellowish orange (10 YR 5/3), stony and gravelly clay loam, strong aggregates (<1mm) but weakly cohesive granular structure, many very small pores, dry friable consistency, abundant fine and medium roots, subrounded and weakly cemented nodules, clear horizontal irregular boundary

Horizon 2 (B2) : 44-87cm orange (7.5 YR 6/8) stony and gravelly clay loam, strong aggregates but weakly cohesive granular structure, many pores and voids varying size, dry friable consistency, subrounded weakly cemented nodules (quartz, red shale, sandstone), frequent fine and occasional medium roots, clear irregular boundary

Horizon 3 (?C or II) : 88-108cm bright brown matrix (7.5 YR 5/8) with dark red nodules (10 R 3/6) and orange coatings (5 R 6/6), very stony with thin loamy clay matrix,structureless,many pores and voids, dry friable consistency, angular nodules (>50mm), weathered and unweathered compacted fragments, occasional roots

TLB-10 : moderate slope; campo cerrado

Horizon 1 (A1) : 1-2mm grass and leaf litter and severely burnt
0-5cm dark brown (10 YR 3/4), stony (>50mm) and gravelly sandy clay loams, moderate granular structure (1-2mm), many small pores and varying voids, dry friable consistency, abundant fine root mesh, clear irregular boundary.

Horizon 2 (A2) : 6-48cm brown (10 YR 4/6) stony and gravelly sandy clay loam, weak non-cohesive granular structures (<1mm), many small pores and voids, dry friable consistency, abundant fine and medium roots, gradual irregular boundary.

Horizon 3 ($B2^{3}3$) : 49-112cm bright brown (7.5 YR 5/8) with bright brown (2.5 YR 5/8) and dull reddish brown (7.5 R 5/3) nodules, stony and gravelly sandy clay, weak non cohesive granular structure, many small pores and voids, dry friable consistency, fine roots common, quartz fragments frequent throughout profile some exceeding 15cm epsd.

TLB-11 : moderate gradient; open cerrado

Horizon 1 (A1/2) : nearly bare surface between plants and gravel covered
0-35cm dark brown (10 YR 3/3) stony gravelly sandy loam, moderate aggregate (<1mm epsd), dry friable consistency, many very small pores, quartz fragments and shale with some cemented aggregations, abundant fine and medium roots, gradual irregular boundary.

Horizon 2 (B2) : 36-66cm orange (7.5 YR 6/8) stony and gravelly sandy clay loam, weak granular structure (1-2mm), many small pores and varied voids, conglomerates of stones, dry friable consistency, occasional fine and medium roots,abrupt irregular boundary.

HOrizon 3 (b3/C) : 67-100+cm yellowish brown matrix (10 YR 5/6) with stones varying in hue (7.5, 10 R and 2.5 YR), very stony with thin loamy matrix, weak granular to structureless, small pores but mostly voids, dry friable consistency, conglomerates common with quartz (>10cm) common throughout profile, roots rare.

TLB-12 : Moderate gradient; open grassy cerrado

Horizon 1 (A1) : stone covered surface and concretionary (?)breccia
0-12cm dark brown (10 YR 3/4), stony gritty sandy loam, moderate poorly cohesive granular structure (<1mm) many small pores, dry hard consistency, most mat (bunch grasses) with abundant fine and medium roots, gradual horizontal boundary.

Horizon 2 (A2) : 13-54cm brown (10 YR 4/6) stony gritty sandy loam, moderate poorly cohesive granular structure, many small pores, dry hard consistency, abundant fine and medium and occasional large roots, gradual horizontal boundary.

Horixon 3 (B2) : 55-100+cm yellowish brown (10 YR 5/6) stony gritty sandy loam, weak very poorly cohesive granular structure, many medium pores, dry friable consistency, frequent fine and medium roots.

TLB-13 : slightly sloping; open campo cerrado

Horizon 1 (A1/2) : <3mm leaf and grass litter ?highly weathered and conglomerated stony surface
1-12cm brown (10 YR 4/4) stony gritty sandy loams, hard poorly cohesive granular structure (max. 5-10mm, dominantly <1mm epsd), many small pores, dry slightly hard consistency, root mat & abundant fine and medium roots, clear to gradual irregular boundary.

Horizon 2 (B2i) : 13-68cm yellowish brown (10 YR 5/6) sandy clay loam, moderate poorly cohesive granular structure (max. 5mm, dominantly <1mm), many medium pores, dry smooth consistency (matrix), some conglomerate and red shale material, fine and medium roots common, gradual irregular boundary.

Horizon 3 (B2ii) : 69-100+cm bright brown (7.5 YR 5/8) very gravelly and gritty sandy clay loam, structureless matrix between compacted quartz and shale fragments, many small pores (matrix), dry friable consistency, roots rare.

TLB-14 : slightly sloping; open campo cerrado

Horizon 1 (A1/2) : <3mm leaf and grass litter few surface stones
0-15cm brown (10 YR 4/4) stony gravelly and gritty sandy loam, moderate poorly cohesive granular structure (5-10mm dominantly <1mm epsd), many very small pores, dry smooth consistency, abundant fine and medium roots and root mat, gradual sinuous boundary.

Horizon 2 (B2) : 16-100+cm yellowish brown (10 YR 5/6) stony, gravelly and gritty sandy clay loam, weak and very poorly cohesive granular structure (<1mm), many very small pores and voids, dry friable consistency, fine and medium roots common.

TLB-15 : slight gradient; open campo cerrado

Horizon 1 (A1/2) : <1mm scattered grass and slight leaf litter
0-16cm brown (10 YR 4/6) sandy loam, moderate poorly cohesive granular structure (<1mm epsd), dry smooth consistency, many very small pores, numerous nodules and some agglomerations, root mat and abundant fine and medium roots, clear sinuous horizontal boundary.

Horizon 2 (B1/2) : 17-100+cm bright brown (7.5 YR 5/6 - 5/8), sandy clay, weak very poorly cohesive granular structure (<1mm) in matrix, dry friable consistency, many small and medium pores and voids between stones, nodules, dominant (more than 80%), large hard, angular, red and yellow, ironstone, frequent fine and medium roots.

TLB-16 : slight gradient; very open campo cerrado

Horizon 1 (A1/2) : <1mm scattered grass and leaf litter
0-14cm brown (10 YR 4/4), stony gritty sandy loam, weak poorly cohesive granular structure (max. 2cm epsd dominantly <1mm), dry smooth consistency (matrix), nodules: few, small hard and rounded, yello ironstone, root mat with abundant fine and medium roots, clear horizontal boundary.

Horizon 2 (B2i) : 15-32cm bright brown (10 YR 4/4 - 7.5 YR 5/6), stony (8-10cm) gravelly sandy clay loam, weak very poorly cohesive granular structure (max. 5mm, matrix <1mm), dry friable consistency, nodules: dominant large hard and rounded or sub angular, yellow-purple-red ironstone and weathered shale, abundant fine and medium roots, diffuse horizontal boundary.

Horizon 3 (B2ii) : 33-130+cm bright reddish brown (7.5 YR 5/6 - 5 YR 5/8), gravelly sandy clay loam, weak very poorly cohesive structureless, dry friable consistency, nodules: very frequent, small, hard, angular, yellow and red with depth, frequent fine and medium roots.

TLB-17 : slight gradient; campo with very scattered trees

Horizon 1 (A1/2) : <1mm scattered grass litter; no stones
0-23cm, brown (10 YR 4/4) sandy loam, moderate poorly cohesive granular structure (max. 1-2cm epsd dominantly <2mm), many very small pores, dry smooth consistency, root mat with abundant and fine roots, abrupt horizontal boundary.

Horizon 2 (B2i) : 24-90cm yellowish brown (10 YR 5/6) sandy clay loam, weak poorly cohesive angular blocky structure (breaks to >8cm), many small pores, dry friable consistency, frequent fine and medium roots, diffuse horizontal boundary.

Horizon 3 (B2ii) : 91-150cm bright brown (7.5 YR 5/8) to bright reddish brown (5 YR 5/8) with depth, occasionally gravelly sandy clay, weak poorly cohesive angular blocky structure (<3cm), many small pores, dry friable consistency, frequent fine and medium roots.
Compacted stones (similar to TLB 16)

TLB-18 : slight gradient; campo with scattered trees.

Horizon 1 (A1/2) : <1mm sparse grass litter
0-20cm brown (10 YR 4/4) sandy clay loam, moderate poorly cohesive granular structure (dominantly <1mm epsd), many very fine pores, dry slightly hard consistency, root mat with abundant fine and medium roots, clear undulating to horizontal boundary.

Horizon 2 (B1) : 21-26cm yellowish brown (10 YR 5/6) to bright yellowish brown (10 YR 6/6) sandy clay loam, weak poorly cohesive granular structure, many very fine pores, dry slightly hard consistency, frequent fine and medium roots, clear undulating boundary.

Horixon 3 (B2Bi) : 27-100cm bright yellowish brown (10 YR 6/6) sandy clay, moderately strong and cohesive angular blocky structure (>10cm), many small pores, dry smooth consistency, common fine and medium roots, diffuse horizontal boundary.

Horizon 4 (B2ii) : 101-135cm bright brown (7.5 YR 5/8) sandy clay, weak poorly cohesive massive structure breaking to angular fragments (>5cm) many small pores, damp very friable consistency, occasional roots.

TLB-19 : slight gradient; campo limpo

Horizon 1 (A1/2) : <1mm sparse grass litter
0-22cm, dull yellowish brown (10 YR 5/4) slightly gravelly sandy loam, moderately strong and cohesive granular structure, many very small pores, dry smooth consistency, abundant fine and medium roots and root mat, clear undulating horizontal boundary.

Horizon 2 (B2) : 23-100cm bright yellowish brown (10 YR 6/6) slightly gravelly sandy clay, weak moderately cohesive massive structure breaking to angular blocky (>10cm epsd), many small pores, dry friable consistency, fine roots common and occasional medium roots, gradual horizontal boundary.

Horizon 3 (B3) : bright brown (7.5 YR 5/8) sandy clay, weak moderately cohesive massive structure breaking to angular blocky (>5cm), many small pores, damp very friable consistency, occasional fine roots.

TLB-20 : slight gradient; campo sujo (scattered trees and shrubs)

Horizon 1 (A1/2) : <1mm grass litter.
0-22cm dull yellowish brown (10 YR 5/4) sandy loam, moderately strong and cohesive granular structure (>10cm), many very small pores, dry slightly hard consistency, abundant fine and medium roots and root mat, clear irregular boundary.

Horizon 2 (B2) : 23-84cm bright yellowish brown (10 YR 6/6) sandy clay, moderately strong and cohesive massive structure breaking to angular blocky (>10cm), many small pores, fine roots common, gradual horizontal boundary.

Horizon 3 (B3) : 85-135+cm, bright brown (7.5 YR 5/8) sandy clay, moderately strong and cohesive massive structure breaking to angular blocky (>10cm), many small pores, damp very friable consistency, occasional fine roots; occasional fragments weathered red shale.

TLB-21 : slightly sloping ; campo cerrado with occasional small tree/shrub covered murundums

Horizon 1 (A1/2) : <1mm sparse grass litter
0-14cm, brown (10 YR 4/4) gritty sandy loam, moderately strong and cohesive granular structure (max. 1-2cm, dominantly <1mm epsd), many very small pores, dry smooth consistency, abundant fine and medium roots, root mat, clear irregular boundary.

Horizon 2 (B2) : 15-70cm, bright yellowish brown (10 YR 6/8) gritty sandy clay, weak moderately cohesive massive (compacted) structure breaking to angular blocky (>10cm), many small pores, dry smooth consistency, frequent fine and occasional roots, gradual horizontal boundary.

Horizon 3 (B3) : 71-120cm, bright reddish brown (5 YR 5/8) gritty sandy clay, weak moderately cohesive (compacted) sub angular blocky structure (>10cm), many small pores, damp very friable consistency, occasional fine roots.

TLB-22 : level surface of small murundums; campo cerrado

Horizon 1 (A1/2) : <1mm sparse leaf and grass litter
0-10cm dull yellowish brown (10 YR 5/4) sandy clay loam, moderately poorly cohesive granular structure (dominantly <1mm epsd), many very small pores, dry smooth consistency, root mat with abundant fine and medium roots, clear undulating boundary.

Horizon 2 (B2i) : 11-30cm yellowish brown (10 YR 5/6) sandy clay loam, moderate poorly cohesive granular structure, many very small pores, dry smooth consistency, frequent fine and medium and occasional large roots, diffuse irregular boundary.

Horizon 3 (B2ii/B3) : 31-140cm bright yellowish brown (10 YR 6/8) to orange (7.5 YR 6/8) sandy clay loam, moderate poorly cohesive (compacted) sub angular blocky structure (>8cm), many small pores, increasingly damp and friable with depth, frequent fine and occasional medium roots.

TLB-23 : first site upslope of murundums, gentle slope, campo cerrado

Horizon 1 (A1/2) : <1mm scattered leaf and grass litter; stony surface
0-24cm dull yellowish brown (10 YR 5/4) very stony and gritty sandy clay loam, moderate very poorly cohesive granular structure (<1mm epsd), many very small pores and larger voids, dry friable consistency, nodules: dominant, large, hard, irregular (broken), dark red, abundant fine and medium roots; diffuse undulating boundary.

Horizon 2 (B2) : 25-100cm bright yellowish brown (10 YR 6/6), very stony and gritty sandy clay loam, weak very poorly cohesive structureless, many small pores and voids, dry friable consistency, nodules: dominant, large, hard, irregular dark red (outer) and yellow, red and orange (inner), ironstone (?), frequent fine and medium roots.

TLB-24 : slightly sloping, open cerrado

Horizon 1 (A1/2) : <1mm sparse grass and leaf litter, stone covered surface
0-18cm dull yellowish brown (10 YR 4/3), very stony gritty sandy loam, weak very poorly cohesive granular structure (<1mm epsd), many very small pores and many voids, dry smooth consistency (matrix), nodules: dominant, large, hard, irregular, broken, ironstone quartz and ?conglomerated weathered shale, abundant fine and medium roots, diffuse horizontal boundary.

Horizon 2 (B1/2) : 19-100cm bright yellowish brown (10 YR 4/3 - 6/6), very stony gritty sandy clay loam, moderate very poorly cohesive granular structure, many very small pores and many voids, dry soft consistency (matrix), nodules: as with horizon 1 abundant fine and medium roots decreasing with depth to occasional medium.

TLB-25 : slightly sloping, open cerrado

Horizon 1 (A1/2) : <1mm sparse litter; active termites to 20cm.
0-20cm dark brown (termite areas) (10.YR 3/4) to brown (10 YR 4/4), stony gritty sandy clay loam (fewer stones in termite area), moderate poorly cohesive granular structure, many very small pores (matrix), dry smooth consistency (matrix); nodules: dominant, large, hard, angular and irregular, ironstone and concretions, root mat with abundant fine and medium roots, gradual irregular boundary .
two samples: termite (ii) and non termite (iii) sections.

Horizon 2 (B2) : bright yellowed brown (10 YR 6/6), stony gritty sandy clay, weak very poorly cohesive granular structure (<1mm: matrix), many very small pores and voids, dry smooth to friable consistency (matrix), nodules as for horizon 1, frequent fine and occasional medium roots.

TLB-26 : slightly sloping; open cerrado

Horizon 1 (A1/2) : <1mm sparse grass and leaf litter; stony surface
0-24cm dull yellowish brown (10 YR 4/3), stony gritty sandy loam, moderate poorly cohesive, granular matrix (<1mm epsd), many very small pores and voids, dry smooth consistency, nodules: dominant, large (max >16cm), hard, irregular - angular (often fluted), broken, ironstone often concretionary with quartz, roof mat with abundant fine and medium roots.

Horizon 2 (B2) : 25-100cm bright yellowish brown (10 YR 6/6), stony gritty sandy clay loam, weak very poorly cohesive granular structure (<1mm epsd: matrix), many small pores, dry smooth consistency, nodules as for horizon 1, abundant fine and medium roots (upper) to frequent (lower).

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TLB 1-1	0-18		27.7	72.3	0	0	85	15	3	80	5.7			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	P assimilável
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4.9	3.8	1.20	0.68	0.58	0.10	2.56	4.00	14.81	21.37	12	61	0.

Horizonte	C (orgânico) %	N %	$\frac{C}{N}$	ATAQUE POR H_2SO_4 (1:1)					NaOH (0.8%)	$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\ O_2}{R_2O_3}$ (Kr	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
	14.88	1.31	11	10.26	11.98	3.39				1.45	1.23	3.53		

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} / $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← m e q / 100g de TF →										

Table 8 : Soil analyses : Transect Line B (TLB 1-26)

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TLB 2-1	0-12		4.5	95.5	0	0	84	16	3	81	5.3			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.3	3.9	0.50	0.34	0.52	0.10	1.46	3.20	43.16	47.82	3	69	0.20

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0,8%)	SiO 2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de CaC O3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	14.90	1.33	11	12.75	12.24	5.99				1.77	1.35	2,04		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume	H
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real		Símbolo
TLB 3-1	0-10		1.9	98.1	0	0	82	18	3	83	4.6				TLB 4-1

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável	Horizonte
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)				
	3.8	3.5	0.14	0.06	0.05	0.05	0.30	5.20	39.51	45.01	1	94	0.	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0,8%)	SiO 2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de	Horizonte
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO						
	11.59	1.78	6	13.82	13.77	1.80				1.71	1.57	7.65			

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %				Horizonte
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umi	
				← m e q / 100g de TF →											

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TLB 4-1	0-15		1.3	98.7	0	0	86	14	4	71	6.1			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.2	3.5	0.13	0.06	0.08	0.03	0.30	8.00	42.98	51.28	1	96	0.33

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0,8%)	SiO_2 / Al_2O_3 (Ki)	SiO_2 / R_2O_3 (Kr)	Al_2O_3 / Fe_2O_3	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
	13.28	0.64	21	13.82	10.96	1.40				2.14	1.98	7.83		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	$HCO_3^- + CO_3^=$	Cl^-	$SO_4^=$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm				Aparente	Real	
TLB 5-1	0-43		0.4	99.6	0	0	51	49	18	63	1.0			
TLB 5-2	44-64		0.1	99.9	0	0	8	92	53	42	0.1			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4.2	3.5	0.10	0.06	0.30	0.03	0.49	6.20	29.44	36.13	1	93	1.8
	4.2	3.6	0.06	0.00	0.03	0.03	0.12	5.00	7.54	12.66	1	98	0.0

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						NaOH (0.8%)	SiO_2 / Al_2O_3 (Ki)	SiO_2 / R_2O_3 (Kr)	Al_2O_3 / Fe_2O_3	Fe_2O_3 livre %	Equivalente de
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO						
	7.22	0.35	21	0.33	24.48	0.80					0.02	0.02	30.6		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} / $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TLB 6-1	0-33		1.3	98.7	0	0	69	31	6	81	2.2			
TLB 6-2	34-42		0.9	99.1	0	1	24	74	32	57	0.3			
TLB 6-3	43-90		0.5	99.5	0	0	7	93	0	100	0.1			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.4	3.7	0.08	0.06	0.22	0.03	0.39	0.80	33.85	35.04	1	67	0.55
	4.3	3.6	0.04	0.00	0.08	0.04	0.16	3.80	13.69	17.65	1	96	0.06
	5.0	4.0	0.06	0.00	0.03	0.03	0.12	1.00	3.78	4.90	2	89	0.00

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						NaOH (0,8%)					Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO	SiO2 / Al2O3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %		
	7.95	0.46	17	11.75	23.71	1.80				0.84	0.80	13.1			
	2.93	0.12	24	19.54	30.34	2.00				1.09	1.05	15.2			
	0.34	0.04	8	28.64	nd	2.00				nd	nd	nd			

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TLB 7-1	0-20		0.7	99.3	0	0	79	21	4	81	3.8			
TLB 7-2	21-27		1.6	98.4	3	2	16	79	34	57	0.2			
TLB 7-3	28-38		1.0	99.0	2	3	19	76	19	75	0.3			
TLB 7-4	39-104		1.1	98.9	2	2	10	86	0	100	0.1			
TLB 7-5	105-125		57.7	42.3	23	9	17	51	31	39	0.3			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	P assimilável ppm
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4.5	3.9	0.08	0.10	0.17	0.03	0.38	6.00	40.86	47.24	1	94	0.7
	4.7	3.9	0.10	0.00	0.04	0.03	0.17	2.00	7.57	9.74	2	92	0.0
	4.9	4.0	0.11	0.00	0.03	0.03	0.17	1.40	7.51	9.08	2	89	0.0
	5.6	4.1	0.12	0.00	0.03	0.02	0.17	1.00	3.78	4.95	3	85	0.0
	4.3	3.6	0.13	0.00	0.02	0.03	0.18	1.00	7.74	8.92	2	85	0.0

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						ATAQUE POR NaOH (0.8%)	$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\ O_2}{R_2\ O_3}$ (Kr	$\frac{Al_2\ O_3}{Fe_2\ O_3}$	$Fe_2\ O_3$ livre %	Equivalente de
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO						
	10.66	0.51	21	11.26	21.93	2.40					0.87	0.81	9.13		
	1.64	0.12	14	17.13	20.40	3.20					1.43	1.30	6.38		
	1.38	0.10	14	19.54	20.40	2.80					1.63	1.50	7.29		
	0.61	0.04	15	22.76	40.29	2.00					0.96	0.93	20.15		
	0.83	0.04	21	17.13	14.79	7.98					1.97	1.46	1.95		

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
B 8-1	0-30		17.0	83.0	9	3	21	67	12	82	0.3			
B 8-2	31-76		31.4	68.6	8	4	16	72	7	90	0.2			
B 8-3	77-86	24.8	59.1	16.1	50	5	17	28	0	100	0.6			
B 8-4	87-130		0.9	99.1	3	2	55	40	0	100	1.4			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.4	3.8	0.16	0.08	0.18	0.03	0.45	2,00	11.69	14.14	3	82	0.30
	5.2	4.2	0.16	0.00	0.04	0.03	0.23	1.60	3.51	5.34	4	87	0.00
	5.3	4.9	0.20	0.00	0.03	0.03	0.26	0.00	1.48	1.74	15	0	0.00
	5.9	5.1	0.16	0.00	0.02	0.03	0.21	0.00	0.66	0.87	24	0	0.00

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						NaOH (0.8%)	SiO2 / Al2O3 (Ki)	SiO2 / R2O3 (Kr	Al2O3 / Fe2O3	Fe2O3 livre %	Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO						
	2.95	0.22	13	11.75	14.53	8.98					1.37	0.99	1.62		
	0.93	0.07	13	12.25	19.12	10.38					1.09	0.81	1.84		
	0.38	0.04	9	9.35	3.31	15.97					4.80	1.18	0.20		
	0.09	0.04	2	18.96	4.33	12.77					7.44	2.58	0.34		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← m e q / 100g de TF →										

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila <0,002 mm			% Argila	Aparente	Real	
TLB 9-1	0-43	13.6	68.0	18.4	16	4	18	62	11	82	0.3			
TLB 9-2	44-87	7.8	79.4	12.8	19	3	10	68	4	94	0.2			
TLB 9-3	88-108	35.7	54.5	9.8	nd	nd	nd	nd	nd	nd	nd			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.5	3.8	0.50	0.18	0.25	0.03	0.96	2.00	11.20	14.16	7	67	0.3
	5.0	4.6	0.15	0.00	0.04	0.03	0.22	1.20	3.25	4.67	5	84	0.0
	5.5	5.0	0.10	0.00	0.03	0.03	0.16	0.00	3.13	3.29	5	0	0.0

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						ATAQUE POR NaOH (0.8%) SiO2 / Al2O3 (Ki)	Si O2 / R2 O3 (Kr)	Al 2 O 3 / Fe 2 O 3	Fe2 O3 livre %	Equivalente de
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	3.08	0.23	13	12.75	26.52	17.96				0.82	0.57	1.48		
	0.83	0.07	12	9.85	27.28	21.36				0.61	0.41	1.28		
	0.72	0.06	12	13.33	31.11	21.16				0.73	0.51	1.47		

Horizonte	100 Na+ / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila <0,002 mm			% Argila	Aparente	Real	
ILB 10-1	0-5	9.1	72.9	18.0	24	4	26	46	9	80	0.6			
ILB 10-2	6-48	23.1	61.8	15.1	24	4	13	59	12	80	0.2			
ILB 10-3	49-112	44.8	43.6	11.6	32	4	10	54	7	87	0.2			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.7	4.0	3.00	1.22	0.38	0.03	4.63	1.60	13.25	19.48	24	26	0.90
	4.5	3.9	0.18	0.03	0.12	0.03	0.36	1.20	7.71	9.27	4	77	0.20
	5.5	5.1	0.08	0.00	0.03	0.03	0.14	0.00	2.31	2.45	6	0	0.00

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						NaOH (0.8%)	SiO 2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO						
	4.50	0.29	15	9.85	22.19	19.76					0.75	0.48	1.12		
	2.10	0.13	16	10.76	26.52	23.15					0.69	0.44	1.15		
	0.54	0.06	9	8.86	27.28	17,36					0.55	0.39	1.57		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl −	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← m e q / 100g de TF →										

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)	Ho
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real		Símbolo
TLB 11-1	0-35	5.0	72.4	22.6	25	4	21	50	15	70	0.4				
TLB 11-2	36-66	31.9	56.7	11.4	25	4	10	61	11	82	0.2				

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável	Horizonte
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)				
	4.4	3.7	0.80	0.31	0.23	0.03	1.37	2.00	13.51	16.88	8	59	0.	
	4.7	4.3	0.08	0.00	0.04	0.03	0.15	1.40	3.88	5.43	3	90	0.	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0,8%)	SiO 2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de	Horizonte
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO						
	3.43	0.25	14	9.35	23.20	23.95				0.68	0.41	0.97			
	1.18	0.09	13	7.53	27.79	19.36				0.46	0.32	1.44			

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %				Horizonte
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umid	
				m e q / 100g de TF											

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
B 12-1	0-12	34.0	50.0	16.0	28	4	19	49	9	82	0.4			
B 12-2	13-54	46.3	41.3	12.4	26	5	12	57	13	77	0.2			
B 12-3	55-100	43.4	45.4	11.2	14	4	11	71	9	87	0.2			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.4	3.8	1.20	0.68	0.29	0.03	2.20	1.60	13.91	17.71	12	42	0.48
	4.5	3.8	0.12	0.08	0.13	0.03	0.36	1.20	9.36	10.92	3	77	0.16
	4.8	4.3	0.02	0.00	0.04	0.03	0.09	0.60	5.01	5.70	1	87	0.00

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						ATAQUE POR NaOH (0,8%)				Fe 2 O 3 livre %	Equivalente de CaCO 3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO	SiO 2 / Al 2 O 3 (Ki)	Si O 2 / R 2 O 3 (Kr)	Al 2 O 3 / Fe 2 O 3			
	3.55	0.24	15	7.12	22.95	22.95				0.53	0.32	1.00			
	1.80	0.14	13	7.95	25.24	26.75				0.53	0.32	0.94			
	1.35	0.10	13	8.86	29.58	22.15				0.51	0.34	1.34			

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl −	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Horizonte		Frações da amostra total %			terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila <0,002 mm			% Argila	Aparente	Real	
TLB 13-1	0-12	33.8	48.7	17.5	21	4	24	51	0	100	0.5			
TLB 13-2	13-68	29.1	56.0	14.8	20	4	12	64	9	86	0.2			
TLB 13-3	69-100	9.0	65.3	25.7	35	4	12	49	0	100	0.2			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	P assimilável
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4.6	3.9	2.00	0.88	0.28	0.03	3.19	1.20	13.32	14.71	22	27	0.
	4.8	4.1	0.14	0.03	0.07	0.02	0.26	0.80	5.96	7.02	4	75	0.
	6.0	5.3	0.06	0.00	0.03	0.02	0.11	0.00	1.32	1.43	8	0	0.

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H_2SO_4 (1:1)						NaOH (0.8%)	$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\ O_2}{R_2O_3}$ (Kr	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO						
	4.11	0.26	16	7.53	23.46	22.95					0.54	0.34	1.02		
	1.60	0.13	12	5.38	25.75	23.55					0.35	0.22	1.09		
	0.44	0.05	9	4.97	27.28	16.77					0.31	0.22	1.63		

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	$HCO_3^{-} = CO_3$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← m e q / 100g de TF →										

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm				Aparente	Real	
B 14-1	0-15		50.7	49.3	20	6	20	54	7	87	0.4			
B 14-2	16-100	18.1	69.2	12.7	18	4	12	66	7	89	0.2			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.5	4.1	0.44	0.23	0.24	0.03	0.94	1.00	9.06	11.00	8	51	0.00
	4.8	4.5	0.10	0.01	0.05	0.03	0.19	0.60	5.01	5.80	3	76	0.00

Horizonte	C (orgânico) %	N %	C / N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0.8%)	SiO 2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de CaC O8 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	2.43	0.20	12	4.97	28.05	25.95				0.30	0.19	1.08		
	1.39	0.09	15	3.31	25.75	21.56				0.22	0.14	1.19		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl −	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← m e q / 100g de TF →										

Horizonte		Frações da amostra total %			terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TLB 15-1	0-16	3.2	40.9	55.9	16	5	32	47	11	76	0.7			
TLB 15-2	17-100	30.4	58.7	10.9	16	5	17	62	8	87	0.3			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	P assimilável ppm
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4.7	4.2	0.64	0.31	0.20	0.03	1.18	0.80	9.76	11.74	10	40	0.0
	5.1	4.6	0.10	0.00	0.05	0.03	0.18	0.40	4.38	4.96	4	69	0.0

Horizonte	C (orgânico) %	N %	$\frac{C}{N}$	ATAQUE POR H_2SO_4 (1:1) e NaOH (0,8%)						$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{SiO_2}{R_2O_3}$ (Kr)	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
	2.72	0.20	14	2.15	23.46	20.96				0.15	0.10	1.12		
	1.64	0.11	15	5.38	27.79	21.96				0.33	0.22	1.27		

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5) meq / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	$HCO_3^{-} + CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
LB 16-1	0-14		14.4	85.6	17	5	31	47	7	85	0.6			
LB 16-2	15-32	2.0	76.0	22.0	11	4	21	64	16	75	0.4			
LB 16-3	33-130		76.9	23.1	26	5	17	52	14	73	0.3			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.8	4.3	0.54	0.23	0.18	0.03	0.98	0.80	9.26	11.04	9	45	0.16
	5.2	4.9	0.08	0.00	0.03	0.03	0.14	0.00	3.96	4.10	3	0	0.03
	6.5	5.6	0.08	0.00	0.03	0.03	0.14	0.00	0.66	0.80	17	0	0.00

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						ATAQUE POR NaOH (0.8%)					Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO	SiO2 / Al2O3 (Ki)	Si O2 / R2O3 (Kr)	Al2O3 / Fe2O3	Fe2O3 livre %		
	2.92	0.21	14	4.97	31.87	20.16				0.26	0.19	1.58			
	1.21	0.08	15	5.38	30.85	21.76				0.30	0.20	1.42			
	0.56	0.05	11	7.53	27.79	30.14				0.46	0.27	0.92			

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO3 − / CO3 =	Cl−	SO4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TLB 17-1	0-23		1.5	98.5	18	5	28	49	4	92	0.6			
TLB 17-2	24-90		6.8	93.2	16	3	29	52	0	100	0.6			
TLB 17-3	91-150		43.2	56.8	13	5	27	55	0	100	0.5			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	Passimilável
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4.8	4.5	0.20	0.06	0.14	0.03	0.43	0.80	8.11	9.34	5	65	0.
	5.7	5.4	0.04	0.00	0.03	0.03	0.10	0.00	2.48	2.58	4	0	0.
	6.5	5.8	0.04	0.00	0.03	0.03	0.10	0.00	0.83	0.93	11	0	0.

Horizonte	C (orgânico) %	N %	$\frac{C}{N}$	ATAQUE POR H_2SO_4 (1:1)						NaOH (0,8%)	$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\ O_2}{R_2O_3}$ (Kr	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO						
	2.74	0.19	14	5.38	nd	14.37					nd	nd	nd		
	0.95	0.07	14	4.55	nd	17.56					nd	nd	nd		
	0.63	0.05	13	0.66	nd	17.36					nd	nd	nd		

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← m e q / 100g de TF →										

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
LB 18-1	0-20		1.6	98.4	21	5	30	44	6	86	0.7			
LB 18-2	21-26		2.4	97.6	21	5	26	48	8	83	0.5			
LB 18-3	27-100		4.2	95.8	15	5	24	56	0	100	0.4			
LB 18-4	101-135		6.0	94.0	13	6	26	55	19	65	0.5			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.8	4.4	0.48	0.13	0.17	0.03	0.81	1.00	8.24	10.05	8	55	0.09
	4.9	4.7	0.16	0.01	0.08	0.03	0.28	0.40	5.38	6.06	5	59	0.00
	5.8	5.4	0.14	0.00	0.03	0.03	0.20	0.00	2.31	2.51	8	0	0.00
	6.2	5.8	0.12	0.00	0.02	0.03	0.17	0.00	0.50	0.67	25	0	0.00

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						ATAQUE POR NaOH (0,8%)			Fe 2 O 3 livre %	Equivalente de CaCO 3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO	SiO 2 / Al 2 O 3 (Ki)	Si O 2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3		
	2.74	0.20	14	5.38	nd	11.78				nd	nd	nd		
	1.81	0.14	13	4.97	nd	11.38				nd	nd	nd		
	0.85	0.07	12	4.55	nd	13.97				nd	nd	nd		
	0.50	0.03	17	4.97	nd	14.37				nd	nd	nd		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm 3		Porosidade % (volume	Horizonte
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm				Aparente	Real		
TLB 19-1	0-22		2.2	97.8	15	4	31	50	5	90	0.6				TLB 20
TLB 19-2	23-100		2.2	97.8	16	6	26	52	0	100	0.5				TLB 20
TLB 19-3	101-140		1.7	98.3	8	5	29	58	12	79	0.5				TLB 20

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	P assimilável	Horizonte
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)				
	4.8	4.2	0.24	0.06	0.17	0.03	0.50	1,00	10.22	11.72	4	67	0.1	
	5.8	5.3	0.06	0.00	0.03	0.03	0.12	0.00	2.31	2.43	5	0	0.0	
	6.4	5.8	0.04	0.00	0.02	0.03	0.09	0.00	0.83	0.92	10	0	0.0	

Horizonte	C (orgânico) %	N %	$\frac{C}{N}$	ATAQUE POR H_2SO_4 (1:1)					NaOH (0.8%)	$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\ O_2}{R_2O_3}$ (Kr	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de	Horizonte
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO						
	2.87	0.22	13	4.14	nd	12.77				nd	nd	nd			
	1.05	0.08	13	4.14	nd	13.37				nd	nd	nd			
	0.62	0.04	15	4.55	nd	13.37				nd	nd	nd			

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %				Horizonte
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umid	
				← m e q / 100g de TF →											

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TLB 20-1	0-22		3.0	97.0	16	6	44	34	3	91	1.3			
TLB 20-2	23-84		2.6	97.4	16	7	38	39	14	64	1.0			
TLB 20-3	85-135		2.7	97.3	11	6	31	52	15	71	0.6			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	Passimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.8	4.6	0.14	0.05	0.09	0.04	0.32	1.00	6.92	8.24	4	76	0.06
	6.0	5.6	0.14	0.00	0.03	0.05	0.22	0.00	1.32	1.54	14	0	0.00
	6.8	5.8	0.20	0.00	0.02	0.04	0.26	0.00	0.50	0.76	34	0	0.00

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						ATAQUE POR NaOH (0,8%)				Fe 2 O 3 livre %	Equivalente de CaCO 3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO	SiO 2 / Al 2 O 3 (Ki)	Si O 2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3			
	2.50	0.17	15	4.14	nd	14.57				nd	nd	nd			
	0.79	0.06	13	3.72	nd	15.97				nd	nd	nd			
	0.54	0.03	18	4.55	nd	14.77				nd	nd	nd			

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl −	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← m e q / 100g de TF →										

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TLB 21-1	0-14		1.2	98.8	17	5	36	42	5	88	0.9			
TLB 21-2	15-70		5.9	94.1	18	8	39	35	13	63	1.1			
TLB 21-3	71-120		6.6	93.4	10	3	41	46	15	67	0.9			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	P assimilável
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4.8	4.3	0.34	0.00	0.20	0.04	0.58	1.00	9.89	11.47	5	63	0.2
	6.2	5.5	0.14	0.10	0.03	0.03	0.30	0.00	1.32	1.62	18	0	0.0
	6.9	6.1	0.10	0.00	0.02	0.03	0.15	0.00	0.00	0.15	100	0	0.0

Horizonte	C (orgânico) %	N %	$\frac{C}{N}$	ATAQUE POR H_2SO_4 (1:1) e NaOH (0,8%)						$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\ O_2}{R_2O_3}$ (Kr	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
	3.40	0.22	15	5.38	nd	15.17				nd	nd	nd		
	0.92	0.06	15	0.33	nd	13.57				nd	nd	nd		
	0.51	0.03	17	4.14	nd	17.96				nd	nd	nd		

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila <0,002 mm				Aparente	Real	
TLB 22-1	0-10		2.3	97.7	12	6	29	53	8	85	0.5			
TLB 22-2	11-30		6.3	93.7	11	5	24	60	8	87	0.4			
TLB 22-3	31-140		20.9	79.1	13	7	23	57	0	100	0.4			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.6	4.3	0.20	0.06	0.14	0.04	0.44	1.20	9.20	10.84	4	73	0.13
	4.9	4.5	0.14	0.01	0.05	0.03	0.23	0.40	6.20	6.83	3	63	0.03
	5.6	5.2	0.12	0.00	0.03	0.03	0.18	0.00	2.64	2.82	6	0	0.06

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0.8%)	SiO 2 / Al 2 O 3 (KI)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de CaC O 3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	2.82	0.20	14	5.79	nd	13.97				nd	nd	nd		
	1.76	3.03	12	5.79	nd	14.97				nd	nd	nd		
	0.93	0.07	13	6.62	nd	15.97				nd	nd	nd		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl −	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				m e q / 100g de TF										

Horizonte		Frações da amostra total %			terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Simbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0.20 - 0.05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TLB 23-1	0-24		76.2	23.8	13	5	27	55	9	84	0.5			
TLB 23-2	25-100	5.4	77.6	17.0	7	4	16	73	13	82	0.2			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	P assimilável
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4.3	3.9	0.34	0.13	0.24	0.03	0.74	1.20	10.35	12.29	6	62	0.
	4.8	4.5	0.14	0.01	0.04	0.03	0.22	0.60	4.85	5.67	4	73	0.

Horizonte	C (orgânico) %	N %	$\frac{C}{N}$	ATAQUE POR H_2SO_4 (1:1)					NaOH (0,8%)	$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\ O_2}{R_2O_3}$ (Kr	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
	2.84	0.21	13	5.38	nd	17.76				nd	nd	nd		
	1.27	0.10	13	7.95	nd	17.16				nd	nd	nd		

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← m e q / 100g de TF →										

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0.20 - 0.05 mm	Silte 0,05 - 0,002 mm	Argila <0,002 mm			% Argila	Aparente	Real	
TLB 24-1	0-18	5.9	72.7	21.4	25	4	23	48	7	85	0.5			
TLB 24-2	19-100	25.0	57.6	17.4	14	5	15	66	10	85	0.2			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4.5	3.8	0.80	0.40	0.27	0.03	1.50	1.80	10.25	13.55	11	54	0.37
	4.6	4.1	0.16	0.01	0.05	0.03	0.25	0.80	4.98	6.03	4	76	0.09

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H2SO4 (1:1) e NaOH (0.8%)						SiO2/Al2O3 (KI)	SiO2/R2O3 (Kr	Al2O3/Fe2O3	Fe2O3 livre %	Equivalente de CaCO3 %
				SiO2	Al2O3	Fe2O3	TiO2	P2O5	MnO					
	2.71	0.19	14	7.12	nd	15.15				nd	nd	nd		
	1.56	0.10	16	5.79	nd	21.96				nd	nd	nd		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO3 − / CO3 =	Cl−	SO4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila <0,002 mm			% Argila	Aparente	Real	
TLB 25-1	0-20i		41.3	58.7	22	5	19	54	4	92	0.4			
TLB 25-2	0-20ii	1.5	70.6	27.9	26	6	21	47	6	87	0.4			
TLB 25-3	21-100	9.9	75.5	14.6	13	5	16	66	9	86	0.2			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	P assimilável
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4.2	3.6	1.20	0.40	0.27	0.03	1.90	2.00	14.17	18.07	10	51	0.
	4.4	3.7	0.50	0.17	0.14	0.03	0.84	1.40	9.82	12.06	7	62	0.
	4.7	4.3	0.16	0.00	0.05	0.04	0.25	1.40	4.05	5.70	4	85	0.

Horizonte	C (orgânico) %	N %	$\frac{C}{N}$	ATAQUE POR H_2SO_4 (1:1)					NaOH (0,8%)	$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\ O_2}{R_2O_3}$ (Kr	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
	3.77	0.24	16	6.62	nd	23.95				nd	nd	nd		
	2.57	0.19	13	6.62	nd	25.34				nd	nd	nd		
	1.14	0.10	11	6.21	nd	18.36				nd	nd	nd		

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umi
				← m e q / 100g de TF →										

Horizonte		Frações da amostra total %			terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0.20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TLB 26-1	0-24	8.1	67.9	24.0	28	6	16	50	10	80	0.3			
TLB 26-2	25-100	39.4	48.4	12.2	10	5	13	72	9	87	0.2			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	P assimilável ppm
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4.3	3.7	0.64	0.30	0.24	0.03	1.21	2.00	11.20	14.41	8	62	0.33
	5.1	4.7	0.12	0.00	0.04	0.03	0.19	1.00	3.79	4.98	4	84	0.03

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H2SO4 (1:1)					NaOH (0,8%)	$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\ O_2}{R_2\ O_3}$ (Kr	$\frac{Al_2\ O_3}{Fe_2\ O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
	2.93	0.21	11	7.95	nd	22.55				nd	nd	nd		
	0.95	0.08	11	0.33	nd	14.37				nd	nd	nd		

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5) meq / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade

Table 9 : Methods of analysis used in the transect surveys

Analyses were carried out on the fine earth fraction (< 2mm epsd) after air drying and sieving to separate the 2-20mm and 20mm fractions.

Granulometric analysis (size fractions): international pipette method using N NaOH as dispersing agent.

Water dispersed clay ('natural clay'): determined by the international pipette method to separate the clay but using distilled water as the dispersing agent.

Exchangeable Ca and Mg : extraction with a solution of N KCl at pH 7 (soil to extractant ratio 1:10); determination in a Hitachi 207 atomic absorption spectrophotometer using lanthanum oxide to reduce interference.

Exchangeable K and Na : extraction in a mixed solution of 0.025N H_2SO_4 and 0.05N HCl; determination in a Kipp's flame photometer.

Exchangeable H and Al : extraction with N $Ca(CH_3COO)_2$ at pH 7; titration against 0.1N NaOH using phenolphtalein as indicator. The Al^{3+} was extracted extracted separately with N KCl at pH 7 and titrated against 0.1N NaOH using bromothymol blue as indicator. The H+ level was obtained by subtraction of the Al^{3+} from the total acidity.

Assimilable P (North Carolina method) : extracted with a mixed solution of 0.025N H_2SO_4 and 0.05 N HCl; determination colorimetrically from solution obtained from reduction of phosphoro-molybdate complex resulting from the reaction of the soil phosphates with ammonium molybdate with ascorbic acid and bismuth as catalyst (Vettori 1969).

Laterisation complex'(% SiO_2, % Al_2O_3 , % Fe_2O_3) : extraction by boiling for an hour in H_2SO_4 (d.147) and filtering. SiO_2 obtained from fraction not rendered soluble by acid attack, boiling in 5% Na_2CO_3; determination colorimetrically from reduced silico-molybdate complex resulting from reaction of soil SiO_2 with ammonium molybdate using ascorbic acid. Al_2O_3 obtained from aliquot of filtrate from acid attack; separation from Fe using 40% NaOH; indirect determination by titrating excess of Titriplex III with $ZnSO_4$ and dithizone as indicator; Fe_2O_3 obtained after reducing the Fe^{3+} to Fe2+ in a solution of stannous chloride with excess oxidised by mercuric

Table 9 (continued)

chloride; determination chromographically in presecnce of PO_4^{3+} with diphenalamine as indicator.

Organic C% : (Tiurin) using 0.4N $K_2Cr_2O_7$ as oxidising agent and silver suphate as catalyst.

Organic and ammonium N% : (Kjeldahl) digestion in H_2SO_4 with copper and sodium sulphate; distillation with 40% NaOH and ammonia absorbed in 4% H_3BO_4; determined by back titration against 0.1N H_2SO_4 using a mixed indicator (Vettori 1969).

pH : 1:1 soil to H_2O ratio (50g x 50ml); determined potentiometrically; repeated with N KCl.

Calculated indices:

Clay flocculation : $\frac{\text{total clay - clay dispersed in water x 100}}{\text{total clay}}$

S value (sum of exchangeable bases) : $Ca^{2+} + Mg^{2+} + Na^{+} + K^{+}$

T value (cation exchange capacity) : $S + H^{+} + Al^{3+}$

V value (% base saturation) : $\frac{S \times 100}{T}$

weathering indices : $Ki = \frac{1.7 \times SiO_2\%}{Al_2O_3\%}$

$$Kr = \frac{1.7 \times SiO_2\%}{Al_2O_3\% + 0.6375\ Fe_2O_3\%}$$

Aluminium saturation : $\frac{100 \times Al^{3+}}{Al^{3+} + S}$

3. Soils characteristic of arboreal cerrado (CER)

Six profiles were chosen randomly within the cerrado reserve, parallel to the track running from the central Fazenda to the Olho de Água da Onça (Figure 2). The profiles were located some 50 to 100m away from the track to avoid possible disturbance and although the cerrado varied in density, the ground vegetation was clearly developed everywhere and there was no visible vegetation gradient or pattern to influence the choice of site.

The profile descriptions are given in Table 10. The physical and chemical analyses are detailed in Table 11.

With the possible exception of CER 1 which lies closest to the Olha de Água da Onça, the profile descriptions indicate a generally uniform appearance and consequently, the average figures for the physical and chemical analyses may be considered as characteristic of the cerrado soils in this area (Table 12).

Table 12 Averaged figures for the cerrado soil

Horizon		'A'	'B'
Texture	coarse sand (%)	2-3	2-3
	fine sand (%)	2-3	2
	silt (%)	13.8	10.7
	clay (%)	81.2	85.5
Clay dispersable in water (%)		47.3	37.3
Degree of flocculation (%)		42.5	54.7
Silt/clay (ratio)		0.16	0.13
pH water		4.5	4.9
KCl 1N		4.0	5.1
Exchange complex (meq/100g)	Ca) Mg)	0.20	0.10
	K	0.11	0.02
	Na	0.01	0.01
S Value (Σ)		0.33	0.13
	Al	1.03	0.08
	H	9.00	4.05
T Value (Σ)		10.26	4.33
Base saturation (%)		3.16	3.00
100Al/Si + Al (weathering ratio)		75.3	17.1
Readily assimilable P (ppm)		<0.5	<0.5
Organic C (%)		2.58	1.19
Total N (%)		0.23	0.11
C/N (ratio)		11.7	11.0
H_2SO_4 extractable	SiO_2	15.5	15.4
	Al_2O_3	32.2	32.1
	Fe_2O_3	10.3	10.9
	TiO_2	1.0	1.1
SiO_2/Al_2O_3 (ratio)		0.82	0.81
SiO_2/R_2O_3 (ratio)		0.68	0.67
Al_2O_3/Fe_2O_3 (ratio)		4.92	4.64
100 x Na/T (ratio)		<1	<1
Moisture equivalence (%)		25.6	31.1

Table 10 Profiles representative of the cerrado reserve (CER 1-6)

CER 1: (approximately 50m equidistant from the roads forming the junction near the cabaceira de Corrego da Onca)
Gradient < 3° draining toward cabeceira
(? Yellow-Red Latosol)

Horizon 1 (A1/2) < 3mm leaf and grass litter over
0-11/18cm brown (10 YR 4/4) gravelly sandy loam, hard, poorly cohesive granular structure (max 1cm, dominantly < 1mm epsd), many very small pores, smooth, dry consistency, abundant fine and medium roots, clear horizontal boundary

Horizon 2 (B1/2) 11/18-100+cm, yellowish brown in upper section (10 YR 5/6) to bright brown with depth (7.5 YR 5/6), compacted stony sandy loam, moderate very poorly cohesive granular matrix structure (< 1mm epsd), very small pores in soil matrix between stones, dry smooth and friable consistency, some stones identified as very weathered shale with a characteristic corrugated external appearance, abundant fine medium roots in upper section to occasional below

CER 2: (approximately 0.5 km further along track)
Level site
(?Red Latosol)

Horizon 1 (A1) < 2mm leaf and grass litter over
0-10cm, brown (7.5 YR 4/6) sandy loam, moderately strong and cohesive granular structure (5-10mm and < 1mm epsd), many very small pores, dry slightly hard consistency, abundant fine and medium roots and root mat, clear horizontal boundary

Horizon 2 (A_2) 11-28cm, reddish brown (5 YR 4/8), sandy clay loam moderately strong and cohesive granular structure (max 2-3cm to < 1mm epsd), many very small pores, dry, slightly hard consistency, fine and medium roots common, diffuse horizontal boundary

Horizon 3 ($B_{2/3}$) 29-130+cm, bright reddish brown (5 YR 4/8-5/8) sandy clay, weak poorly cohesive subangular structure (> 8cm), many small pores, dry smooth consistency, fine to medium roots in upper section common becoming rare with depth

CER 3: (approximately 50m from minor track junction; 0.5 to 1.0 km further along track)
Level site
(?Red Latosol)

Horizon 1 (A_1) < 2mm mostly grass litter over
0-13cm, brown (7.5 YR 4/6) sandy clay loam, moderate poorly consolidated granular structure (2cm - < 1mm aggregates), many very small pores, dry smooth consistency, abundant fine and medium roots with root mat and occasional large roots, gradual horizontal boundary

Horizon 2 (A_2/B_1) 14-36cm, reddish brown (5 YR 4/8) sandy clay loam, hard moderately cohesive granular structure (> 10cm - c. 1cm), many very small pores, hard dry consistency, fine and medium roots common, diffuse horizontal boundary

Horizon 3 (B_2) 37-130$^+$cm, bright reddish brown (5 YR 4/8) to bright brown at base (5 YR 5/8 - 2.5 YR 5/8), sandy clay, moderate poorly cohesive granular structure (3cm - < 1mm), many small pores, dry smooth consistency, fine and medium roots common

CER 4: (approximately 0.5 km along track)
Level site
(?Red Latosol)

Horizon 1 ($A_{1/2}$) < 2mm leaf and grass litter overlying
0-15/22cm reddish brown (5 YR 4/8) sandy clay, moderate poorly cohesive granular structure (> 8cm - < 1mm epsd), many very small pores, slightly hard dry consistency, abundant fine and medium roots, root mat, gradual undulating boundary

Horizon 2 (B_{2i}) 15/22 - 42cm bright reddish brown (5 YR 4/8-5/8) gritty sandy clay, moderately strong and cohesive granular structure-compacted (> 15cm breaking to < 1mm epsd) many very small pores, dry slightly hard consistency, fine and medium roots common and large roots occasionally, diffuse irregular boundary

Horizon 3 (B_{2ii}) 43-145cm, bright reddish brown (5 YR 5/8) sandy clay, weak, poorly cohesive compacted granular structure (breaking to 75cm - < 1mm aggregates), many small pores, dry smooth consistency, fine and medium roots common to occasional with depth

CER 5: (approximately 0.5 km further along track)
Level site
(? Red Latosol)

Horizon 1 ($A_{1/2}$) < 2mm leaf and grass litter over
0-17/20cm reddish brown (5 YR 4/6) gritty sandy clay, moderate poorly cohesive granular structure (1-2cm to < 1mm), many very small pores, dry smooth consistency, very abundant fine and medium roots and root mat, gradual undulating boundary

Horizon 2 (B_{2i}) 17/20 - 58cm, bright reddish brown (5 YR 4/6-5/8), gritty sandy clay, moderately strong and cohesive compacted granular structure (> 8cm - < 5-10mm), many very small pores, slightly hard dry consistency, frequent fine and medium roots, diffuse horizontal boundary

Horizon 3 (B_{2ii}) 59-130^{+}cm, bright brown (5 YR 5/8 / 2.5 YR 5/8), gritty sandy clay, weak poorly cohesive compacted angular blocky structure (> 5cm), many small pores, dry smooth consistency, fine and medium roots common

CER 6: (approximately 0.5 km further along track)
Level site
(?Red Latosol)

Horizon 1 ($A_{1/2}$) < 2mm leaf and grass litter over
0-14cm reddish brown (5 YR 4/6), sandy clay loam, moderately poorly cohesive granular structure (> 3cm - dominantly < 1mm epsd), many very small pores, dry smooth consistency, abundant fine and medium root and root mat, clear horizontal boundary

Horizon 2 (B_{2i}) 15-50cm, reddish brown (5 YR 4/8), sandy clay, hard moderate to very cohesive subangular blocky structure (> 8cm-<1mm), many very small pores, slight lustre, hard dry consistency, abundant fine and medium roots, gradual horizontal boundary

Horizon 3 (B_{2ii}/B_3) 51-140^{+}cm, bright reddish brown (5 YR 5/8) to bright brown (2.5 YR 5/8), sandy clay, weak poorly cohesive compacted angular blocky structure (> 5cm - < 1mm), many small pores, dry smooth consistency, frequent (top section) to common (base) fine and medium roots

Table 11 : Soil analyses: cerrado transect (CER 1-6)

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
CER 1-1	0-11/18	8,7	22,7	68,6	6	5	17	72	27	63	0,24			
CER 1-2	11/18-100	41,7	45,4	12,9	4	2	12	82	55	33	0,15			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,5	4,1	0,3	0,16	0,01	0,5	0,9	9,8	11,2	4	64		<0,5
	4,5	4,7	0,1	0,04	0,01	0,2	0	5,9	6,1	3	0		<0,5

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0,8%)	SiO 2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe2 O3 livre %	Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O3	Ti O 2	P 2 O 5	MnO					
	3,07	0,26	12	6,7	32,5	11,0	0,97			0,35	0,29	4,63		
	1,73	0,17	10	6,5	32,3	11,9	0,95			0,34	0,28	4,26		

Horizonte	100 Na / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				m e q / 100g de TF										
	<1													30,1
	<1													30,9

Horizonte		Frações da amostra total %			terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
CER 2-1	0-10		1,9	98,1	3	2	15	80	40	50	0,19			
CER 2-2	11-28		1,4	98,6	2	2	12	84	51	39	0,14			
CER 2-3	29-130		0,5	99,5	3	2	10	85	59	31	0,12			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,3	3,9	0,2	0,16	0,01	0,4	1,2	10,2	11,8	3	75	<0,
	4,2	4,2	0,1	0,07	0,01	0,2	0,5	7,0	7,7	3	71	<0,
	4,7	5,2	0,1	0,01	0,01	0,1	0	3,5	3,6	3	0	<0,

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1) SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO	ATAQUE POR NaOH (0,8%) SiO 2 / Al 2 O 3 (Ki)	Si O 2 / R 2 O 3 (Kr)	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de
	2,86	0,21	14	14,7	31,9	10,0	0,86			0,78	0,65	5,00		
	1,92	0,19	10	14,8	32,5	10,5	1,15			0,77	0,64	4,86		
	0,98	0,08	12	14,7	32,7	10,7	1,14			0,76	0,63	4,79		

Horizonte	100 Na + / T	Pasta saturada C.E do extrato mmhos/cm 25°C	Pasta saturada Água %	Sais solúveis (extrato 1:5) Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Constantes hídricas % Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← m e q / 100g de TF →										
	<1													30,
	<1													31,
	<1													31,

Horizonte		Frações da amostra total %			terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
ER 3-1	0-13		0,9	99,1	2	1	11	86	55	36	0,13			
ER 3-2	14-36		0,4	99,6	1	1	10	88	55	38	0,11			
ER 3-3	37-130		0,5	99,5	2	1	8	89	0	100	0,09			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,4	4,0	0,1	0,13	0,01	0,2	1,1	8,4	9,7	2	85	<0,5
	4,3	4,2	0,1	0,05	0,01	0,2	0,5	6,4	7,1	3	71	<0,5
	5,2	5,5	0,1	0,01	0,01	0,1	0	2,8	2,9	3	0	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						NaOH (0,8%) SiO 2 / Al 2 O 3 (Ki)	SiO 2 / R 2 O 3 (Kr)	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	2,36	0,22	11	18,6	31,5	9,4	1,12			1,00	0,84	5,25		
	1,71	0,17	10	18,6	31,4	9,7	1,14			1,01	0,84	5,08		
	0,85	0,08	11	19,0	31,9	10,1	1,12			1,01	0,84	4,96		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl −	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
	<1													30,9
	<1													31,5
	<1													31,4

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)	Hor
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real		Símbolo
CER 4-1	0-15/22		0,9	99,1	1	2	13	84	44	48	0,15				ER 5-1
CER 4-2	15/22-42		0,7	99,3	2	1	10	87	54	38	0,11				ER 5-2
CER 4-3	43-145		0,7	99,3	3	2	11	84	1	99	0,13				ER 5-3

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	Psimilável	Horizonte
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)				
	4,5	4,0	0,1		0,12	0,01	0,2	1,1	9,0	10,3	2	85	<0,	
	4,8	4,5	0,1		0,03	0,01	0,1	0,2	4,6	4,9	2	67	<0,	
	5,4	5,5	0,1		0,01	0,01	0,1	0	2,6	2,7	4	0		

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0,8%)	SiO2/Al2O3 (Ki)	SiO2/R2O3 (Kr)	Al2O3/Fe2O3	Fe2O3 livre %	Equivalente de	Horizonte
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO						
	2,31	0,18	13	19,1	31,9	9,7	0,94			1,02	0,85	5,16			
	1,41	0,13	11	19,1	32,3	10,0	1,04			1,01	0,84	5,07			
	0,76	0,08	10	18,5	32,7	10,5	1,14			0,96	0,80	4,89			

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %				Horizonte
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl −	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umid	
				← m e q / 100g de TF →											
	<1													31,	
	<1													31,	
	<1													32,	

Horizonte		Frações da amostra total %			terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
ER 5-1	0-17/20		1,8	98,2	3	2	12	83	55	34	0,14			
ER 5-2	17/20-58		1,0	99,0	2	1	10	87	61	30	0,11			
ER 5-3	59-130		0,8	99,2	1	1	9	89	19	79	0,10			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,7	3,9	0,2	0,13	0,01	0,3	1,3	9,5	11,1	3	81	<0,5
	4,8	4,5	0,1	0,02	0,01	0,1	0,2	5,2	5,5	2	67	<0,5
	5,3	5,4	0,1	0,01	0,01	0,1	0	2,6	2,7	4	0	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0,8%)	SiO 2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	2,77	0,28	10	18,0	31,2	10,4	0,95			0,98	0,81	4,71		
	1,41	0,14	10	18,5	30,9	10,7	1,08			1,02	0,83	4,53		
	0,79	0,08	10	17,2	31,7	10,8	1,19			0,92	0,76	4,60		

Horizonte	100 Na / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25ºC	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				m e q / 100g de TF										
	<1													30,5
	<1													29,9
	<1													30,4

Horizonte		Frações da amostra total %			terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm 3		Porosidade % (volume
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm				Aparente	Real	
CER 6-1	0-14		1,0	99,0	2	2	16	80	57	29	0,20			
CER 6-2	15-50		1,4	98,6	2	1	18	79	67	15	0,23			
CER 6-3	51-140		0,5	99,5	3	2	9	86	21	76	0,10			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	Passimilável
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,7	4,0	0,3	0,14	0,01	0,5	1,2	9,7	11,4	4	71	< 0	
	4,7	4,2	0,1	0,07	0,01	0,2	0,5	7,1	7,8	3	71	< 0	
	5,3	5,3	0,1	0,01	0,01	0,1	0	3,1	3,2	3	0		

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1) NaOH (0,8%)						SiO 2 / Al 2 O 3 (Ki)	Si O 2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	2,81	0,23	12	15,8	34,1	10,9	1,04			0,79	0,65	4,91		
	1,89	0,15	13	15,7	32,5	11,3	1,06			0,82	0,67	4,51		
	0,94	0,08	12	14,9	31,4	12,0	1,21			0,81	0,65	4,10		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umi
	< 1													30,
	< 1													29,
	< 1													30,

4. Cerradão - cerrado line transect (CTC)

A series of profiles were examined extending from the cerradão reserve, which lies on gently sloping land leading down to the Riberão de Gama, to the open cerrado immediately off the track through the ecological reserve.

The aim was to characterise the soils of each vegetation community and to examine the changes which occur across the boundary. Fourteen profiles were described and analysed at 50m intervals along the transect; five were clearly cerrado (CTC 1-5), one was intermediate but mostly cerrado (CTC 6), and the remainder were in cerradão (CTC 7-14). The profile descriptions are given in Table 13; the physical and chemical properties are summarised in Table 14.

Table 13 : Soil profile descriptions: cerradão-cerrado transect (CTC 1-14)

CTC-1 : level, open cerrado
(?Red latosol)

Horizon 1(A1) : <1mm grass litter and termite activity to 10mm.
0-15/20cm, brown (10 YR 4/6), gritty sandy clay loam, moderately strong granular structure (<1mm epsd), many very small pores, dry smooth consistency, abundant fine and occasional medium roots, clear horizontal boundary.

Horizon 2 (A2/3) : 15/20 - 31cm, bright brown (7.5 YR 5/6), sandy clay loam, moderate granular structure (<1mm epsd), many very fine pores, dry smooth consistency, fine roots common with occasional medium roots, gradual horizontal boundary.

Horizon 3 (B2) : 32-70/95cm, orange to bright brown (7.5 YR 6/8 - 5/8), sandy clay, weak non-cohesive massive structure breaking to weak sub angular block aggregates (<20mm epsd), many small pores, dry friable consistency, fine roots common with occasional medium, abrupt inclined boundary.

Horizon 4 ('C') : 70/95 - 100+cm, orange to bright brown (7.5 YR 6/8 - 5/8) with dark reddish brown nodules (2-5 YR 3/6), sandy clay with compacted nodules diameter <4cm, compacted nodules and friable matrix, nodules partly iron, partly shale with some quartz, occasional fine and medium roots.

CTC-2 : level, open cerrado
(?Red latosol)

Horizon 1 (A1/2) : 14cm termite mound and <1mm grass litter over
0-38cm, brown (10 YR 4/4) sandy clay loam, strong moderately cohesive granular structure (<1cm mostly <1-2mm epsd), many very small pores, dry smooth consistency, abundant fine roots, abrupt spheroidal lower boundary of termite mound otherwise clear sinuous boundary.

Horizon 2 (B2/3) : 39-108cm, orange (7.5 YR 6/6) in upper section to orange (7.5 YR 6/8) lower, gritty sandy clay loam, weak poorly cohesive massive structure fragmenting to sub angular blocky, many small pores, dry friable consistency, fine roots common occasionally medium, clear to abrupt horizontal boundary.

Horizon 3 (?C) : 109-112+cm, orange (7.5 YR 6/8) matrix with dark reddish brown (2.5 YR 3/6) fractured stones/nodules, gritty sandy clay loam matrix and compacted stones, weak poorly consolidated massive structure fragmenting to sub angular blocky (matrix), many small pores in mineral matrix between compacted stones/nodules, dry friable consistency (matrix), no visible roots.

CTC-3 : level, open cerrado
(?Red latosol)

Horizon 1 (A1/2) : <2mm grass and occasional shrub litter over
0-18cm (0 - 2/3cm active reworking by termites), brown (7.5 YR 4/4) sandy clay loam occasionally gravelly, moderate poorly cohesive granular structure (mostly <5-10mm epsd), many very fine pores, dry slightly hard consistency, abundant fine and medium roots with root mat, clear sinuous boundary.

Horizon 2 (B2) : 19-53cm, bright brown (7.5 YR 5/6 - 5/8) sandy clay loam, weak very poorly cohesive sub angular structure (<2.5cm), many small pores, dry smooth consistency, fine roots common occasionally medium, diffuse irregular boundary.

Horizon 3 (B3) : 54-150cm, bright reddish brown (5 YR 5/8) clay loam, weak very poorly cohesive sub angular structure to structureless, many small pores, dry friable consistency, occasional medium and fine roots and one large root.

CTC-4 : level, shrubby and medium thick arboreal cerrado
(?Red latosol)

Horizon 1 (A1/2) : <1mm grass and leaf litter
0-16 (0-4A1)cm, brown (7.5 YR 4/4), gritty sandy clay loam, moderately strong and cohesive granular structure (max 2cm epsd, mostly <2-5mm), many very fine pores, dry and slightly hard consistency, abundant fine and medium roots, thick root mat, clear sinuous boundary.

Horizon 2 (B1/2) : 17-40cm, bright brown (7.5 YR 5/8), sandy clay loam, moderate poorly cohesive granular structure, many small pores, dry smooth consistency, fine and medium roots common, diffuse irregular boundary.

Horizon 3 (B3) : 41-140+cm, bright reddish brown (5YR 5/8), clay loam, weak very poorly cohesive structureless, many small pores, dry friable consistency, occasional fine and medium roots.

CTC-5 : level, medium thick arboreal cerrado
(?Red latosol)

Horizon 1 (A1/2) : <1mm grass and leaf litter with bare patches
0-15mm (termites active throughout), brown (7.5 YR 4/6) sandy clay loam, moderate poorly cohesive granular structure (dominantly <1mm epsd), many very small pores, dry slightly hard consistency, abundant fine and medium bunch grass roots and occasional medium tree roots, gradual sinuous boundary.

Horizon 2 (B1/2) : 16-30cm, reddish brown (5 YR 4/8), sandy clay loam, moderate poorly cohesive sub angular blocky structure, many very small pores, dry smooth consistency, abundant fine and occasional medium roots, gradual irregular boundary.

Horizon 3 (B3) : 31-140+cm, bright reddish brown (5 YR 5/8), sandy clay loam, weak poorly cohesive massive structure fragmenting to sub angular blocky, many small pores, dry friable consistency, fine and medium roots common decreasing to occasional with depth.

CTC-6 : level, medium dense arboreal cerrado
(?Dark Red latosol)

Horizon 1 (A1/2) : <2mm grass and leaf litter and bare patches
0-10cm, dark reddish brown (5 YR 3/6), sandy clay loam, moderate poorly cohesive granular structure (max 1cm epsd, mostly 1-2mm), many very small pores, dry slightly hard consistency, abundant fine and medium roots, clear horizontal boundary.

Horizon 2 (B1/2) : 11-30cm, reddish brown (5 YR 4/8), sandy clay loam, moderate poorly cohesive granular structure, many small pores, dry smooth consistency, abundant fine and medium roots, gradual irregular boundary.

Horizon 3 (B3) : 31-130+cm, reddish brown (2.5 YR 4/6), sandy clay loam, weak very poorly cohesive massive structureless, many small pores, dry friable consistency, fine and medium roots common occasionally large.

CTC-7 : level, cerradão
(?Dark Red Latosol)

Horizon 1 (A1/2) : <1mm grass and leaf litter with bare patches
0-8cm, dark reddish brown (5 YR 3/6), sandy clay loam, weak poorly cohesive granular structures (max 5-10mm, dominantly <1-2mm epsd), many very small pores, dry smooth consistency, abundant fine and medium roots, clear horizontal boundary.

Horizon 2 (B1/2) : 9-37cm reddish brown (5 YR 4/8), sandy clay loam, weak poorly cohesive granular structure (dominantly <1-2mm), many small pores, dry smooth consistency, fine and medium roots common, gradual horizontal boundary.

Horizon 3 (B3) : 38-120+cm, reddish brown (2.5 YR 4/8), sandy clay loam, weak very poorly cohesive structureless, many small pores, dry friable consistency, fine to medium roots to occasional

CTC-8 : level, medium dense cerradão
(?Dark Red Latosol)

Horizon 1 (A1) : <2mm grass and leaf litter, burnt
0-8cm, dark reddish brown (5 YR 3/4), sandy clay loam, moderate poorly cohesive granular structure (max. 10-20mm to <1mm epsd), many very small pores, dry hard consistency, abundant fine and medium roots, clear horizontal boundary.

Horizon 2 (A2) : 9-23cm, dark reddish brown (5 YR 3/6), sandy clay loam, strong poorly cohesive granular structure, many very small pores, dry slightly hard consistency, abundant fine and medium roots, gradual horizontal boundary.

Horizon 3 (B2i) : 24-100cm, reddish brown (2.5 YR 4/8), sandy loam, weak very poorly cohesive sub angular blocky structure (max. >5cm fragmenting rapidly), many small pores, dry smooth consistency, abundant fine and medium roots, diffuse horizontal boundary.

Horizon 4 (Bii/B3) : 100-140cm reddish brown (2.5YR 4/8) sandy loam, weak very poorly cohesive structuress, many small pores, dry smooth consistency, occasional fine and medium roots

CTC-9 : level, medium dense cerradão
(?Dark Red Latosol)

Horizon 1 (A1/2) : <2mm grass and leaf litter, burnt
0-25cm dark reddish brown (5 YR 3/4-3/6) sandy loam, moderately strong and cohesive granular structure (max 1-2cm to 1mm epsd), many small pores, dry hard consistency, abundant fine and medium roots occasionally large, gradual horizontal boundary

Horizon 2 (B2) : 26-82cm reddish brown(2.5 YR 4/6) sandy loam, weak poorly cohesive sub angular blocky structure, many small pores, dry smooth consistency, fine and medium roots common with several large roots, diffuse horizontal boundary

Horizon 3 (B3) : 83-138cm reddish brown (2.5 YR 4/8) very fine sandy loam, weak very poorly cohesive sub angular blocky structure, many small pores, dry smooth consistency, occasional medium and large roots

CTC-10 : level, medium dense cerradão
(Dark Red Latosol?)

Horizon 1 (A1/2) : <2mm grass and leaf litter
0-29cm (termites abundant in top few cm) dark reddish brown (5 YR 3/4), sandy clay loam, moderate poorly cohesive granular structure(max 10mm to <1mm epsd), many very fine pores, dry slightly hard consistency, abundant fine and medium roots, thick bunch grass root mat, clear horizontal boundary

Horizon 2 (B2i) : 30-100cm reddish brown (2.5 YR 4/8) fine sandy clay loam, moderate poorly cohesive sub angular blocky structure (>4cm to <1mm epsd), many small pores, dry smooth consistency, fine and medium roots common, diffuse horizontal boundary

Horizon 3 (B2ii/B3) : 101-140cm reddish brown (2.5 YR 4/8) clay loam, weak very poorly cohesive sub angular blocky structure (>7cm fragmenting to <1mm), many small pores, dry smooth consistency, occasional fine and medium roots

CTC-11 : level, medium dense cerradão
(Dark Red Latosol?)

Horizon 1 (A1/2) : <2mm grass and leaf litter, burnt
0-20cm dark reddish brown (5 YR 3/6), termites active in upper section, sandy clay loam, hard moderately cohesive granular structure (5-10mm epsd) to sub angular blocky (>8cm epsd with termite hardening), many very fine pores, dry slightly hard consistency, abundant fine and medium roots with root mat and occasional large roots, clear irregular boundary

Horizon 2 (B2i) : 21-76cm reddish brown (2.5 YR 4/8) sandy clay loam, moderately strong and cohesive sub angular blocky structure (>8cm), many small pores, dry slightly hard consistency, fine and medium roots common, diffuse horizontal boundary

Horizon 3 (B2ii/B3) : 77-120cm reddish brown(2.5 YR 4/8) sandy clay loam, weak poorly cohesive sub angular blocky structure (>5cm), many small pores, dry smooth consistency, occasional fine and medium roots, one large root

CTC-12 : level open cerradão
(?Dark Red Latosol)

Horizon 1 (A1/2) : <1mm grass and leaf litter with bare patches
0-13cm dark reddish brown (5 YR 3/6) sandy clay loam, hard moderately cohesive granular structure (max 3cm to mostly <2mm epsd), many very small pores, dry hard consistency, abundant fine and medium roots, clear sinuous boundary

Horizon 2 (B2i) : 14-72cm reddish brown (2.5 YR 4/8) sandy clay, moderately strong and cohesive sub angular blocky structure (>8cm), many small pores,dry smooth consistency, abundant fine and medium roots(upper) to frequent (lower), diffuse horizontal boundary

Horizon 3 (B2ii/B3) : 73-120cm reddish brown (2.5 YR 4/8) sandy clay, moderate poorly cohesive sub angular blocky structure(>6cm), many small pores, dry smooth consistency, occasional fine and medium roots

CTC-13 : level, open cerradão
(?Dark Red Latosol)

Horizon 1 (A1/2) : <2mm grass and leaf litter
0-30cm (termites active to 20cm) dark reddish brown (5 YR 3/6) clay loam, hard moderately cohesive angular blocky structure(>8cm), many very small pores, dry hard consistency, abundant fine and medium roots and root mat, clear irregular boundary

Horizon 2 (B2i) : 31-80cm (termite casts to 68cm) reddish brown (2.5 YR 4/6), sandy clay loam, moderately strong and cohesive blocky structure (>5cm), many small pores, dry slightly hard consistency, fine roots common medium occasional, diffuse horizontal boundary

Horizon 3 (B2ii/B3) : 81-140cm reddish brown (2.5 YR 4/8) sandy clay loam, weak very poorly cohesive angular blocky structure (>5cm), many small pores, dry smooth consistency, occasional fine and medium roots

CTC-14 : level, medium dense cerradão
(?Dark Red Latosol)

Horizon 1 (A1/2) : <2mm grass and leaf litter
0-5/12cm dark reddish brown (5 YR 3/6) clay loam, moderately strong and cohesive granular (<2mm) and angular blocky (20-50mm) structure, many very fine pores, dry hard consistency abundant fine and medium roots, clear sinuous boundary

Horizon 2 (B1) : 5/12-36cm reddish brown (2.5 YR 4/8) clay loam,moderately strong and cohesive angular blocky structure (max 5cm mostly 5-10mm), many very small pores, dry slightly hard consistency, fine and medium roots, gradual horizontal boundary

Horizon 3 (B2i) : 37-70cm reddish brown (2.5 YR 4/6) sandy clay loam, weak poorly cohesive angular blocky structure (fragmenting to c.5cm epsd), many small pores, dry smooth consistency, fine and medium roots common, diffuse horizontal boundary

Horizon 4 (B2ii/B3) : 71-120cm reddish brown (2.5 YR 4/6) sandy clay loam, weak very poorly cohesive angular blocky (>5cm), many small pores, dry smooth consistency, occasional fine and medium roots

CTC-14 : level, medium dense cerradão
(?Dark Red Latosol)

Horizon 1 (A1/2) : <2mm grass and leaf litter
0-5/12cm dark reddish brown (5 YR 3/6) clay loam, moderately strong and cohesive granular (<2mm) and angular blocky (20-50mm) structure, many very fine pores, dry hard consistency abundant fine and medium roots, clear sinuous boundary

Horizon 2 (B1) : 5/12-36cm reddish brown (2.5 YR 4/8) clay loam,moderately strong and cohesive angular blocky structure (max 5cm mostly 5-10mm), many very small pores, dry slightly hard consistency, fine and medium roots, gradual horizontal boundary

Horizon 3 (B2i) : 37-70cm reddish brown (2.5 YR 4/6) sandy clay loam, weak poorly cohesive angular blocky structure (fragmenting to c.5cm epsd), many small pores, dry smooth consistency, fine and medium roots common, diffuse horizontal boundary

Horizon 4 (B2ii/B3) : 71-120cm reddish brown (2.5 YR 4/6) sandy clay loam, weak very poorly cohesive angular blocky (>5cm), many small pores, dry smooth consistency, occasional fine and medium roots

Table 14 : Soil analyses : cerradao-cerrado transect (CTC 1-14)

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 -0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila <0,002 mm				Aparente	Real	
CTC 1-1	0-15/20		2,3	97,7	4	3	26	67	29	57	0,39			
CTC 1-2	15/20-31		1,9	98,1	4	3	22	71	44	38	0,31			
CTC 1-3	32-70/95		2,8	97,2	5	4	30	61	0	100	0,49			
CTC 1-4	70/95-100	1,3	88,7	10,0	9	2	27	62	**		0,44			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,8	4,1	0,7	0,35	0,01	1,1	0,9	9,3	11,3	10	45	<0,5
	4,9	4,4	0,1	0,13	0,01	0,2	0,3	5,9	6,4	3	60	
	5,0	5,3	0,1	0,07	0,01	0,2	0	3,1	3,3	6	0	<0,5
	5,0	5,4	0,1	0,11	0,04	0,3	0	3,0	3,3	9	0	<0,5

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1) SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO	ATAQUE POR NaOH (0.8%) SiO 2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de CaC O 3 %
	3,11	0,24	13	9,6	28,5	11,8	0,57			0,57	0,45	3,79		
	1,90	0,17	11	10,0	30,1	13,1	0,66			0,56	0,44	3,60		
	0,99	0,12	8	10,0	29,6	13,9	0,64			0,57	0,44	3,34		
	1,15	0,11	10	9,1	28,3	14,9	0,53			0,55	0,41	2,98		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − = CO 3	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← m e q / 100g de TF →										
	<1													27,7
	<1													31,0
	<1													33,3
	1													32,8

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
CTC 2-1	0-38		2,0	98,0	4	3	29	64	38	41	0,45			
CTC 2-2	39-108		3,3	96,7	4	4	27	65	0	100	0,42			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,7	4,1	0,8	0,33	0,02	1,2	0,8	9,1	11,1	11	40	< 0
	5,3	5,6	0,1	0,09	0,01	0,2	0	2,8	3,0	7	0	< 0

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0,8%)	SiO 2 / Al 2 O 3 (Ki)	Si O 2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	2,74	0,24	11	8,9	29,2	13,1	0,55			0,52	0,40	3,50		
	1,01	0,12	8	10,1	30,9	13,9	0,63			0,56	0,43	3,49		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
	< 1													30,
	< 1													33,

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TC 3-1	0-18		1,2	98,8	4	4	25	67	40	40	0,37			
TC 3-2	19-53		0,8	99,2	4	4	22	70	52	26	0,31			
TC 3-3	54-150		1,5	98,5	5	3	24	68	12	82	0,35			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,6	4,0	0,5	0,25	0,01	0,8	1,1	9,5	11,4	7	58	<0,5	
	4,8	4,6	0,1	0,10	0,02	0,2	0,2	5,3	5,7	4	50	<0,5	
	5,3	5,9	0,1	0,04	0,01	0,2	0	1,9	2,1	10	0		

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					ATAQUE POR NaOH (0.8%)	SiO 2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	2,87	0,23	12	8,9	30,5	13,2	0,54			0,50	0,39	3,62		
	1,81	0,15	12	9,4	30,2	13,7	0,60			0,53	0,41	3,46		
	0,76	0,08	10	9,7	32,1	14,3	0,62			0,51	0,40	3,52		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				m e q / 100g de TF										
	<1													35,8
	<1													31,6
	<1													32,9

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm 3		Porosidade % (volume
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm				Aparente	Real	
CTC 4-1	0-16		1,0	99,0	4	3	23	70	34	51	0,33			
CTC 4-2	17-40		1,0	99,0	5	4	22	69	3	96	0,32			
CTC 4-3	41-140		1,0	99,0	5	4	21	70	8	89	0,30			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	Assimilável
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,7	4,0	0,1	0,23	0,02	0,3	0,9	9,3	10,5	3	75	<0,
	4,7	4,4	0,1	0,11	0,01	0,2	0,3	6,4	6,9	3	60	<0,
	5,4	6,0	0,1	0,04	0,01	0,2	0	2,0	2,2	9	0	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0.8%)	SiO 2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	2,96	0,24	12	8,6	31,4	14,1	0,56			0,47	0,36	3,49		
	1,94	0,18	11	9,0	32,3	14,5	0,59			0,47	0,37	3,50		
	0,82	0,10	8	9,6	32,1	15,5	0,65			0,51	0,39	3,25		

Horizonte	100 Na / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
	<1													31,
	<1													31,
	<1													32,

Horizonte		Frações da amostra total %			terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm				Aparente	Real	
TC 5-1	0-15		0,8	99,2	5	3	17	75	31	59	0,23			
TC 5-2	16-30		2,6	97,4	4	4	16	76	33	57	0,21			
TC 5-3	31-140		1,3	98,7	6	4	20	70	6	91	0,29			

P assimilável ppm	Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
		Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
<0,5		5,0	4,1	0,4	0,15	0,01	0,6	0,9	8,6	10,1	6	60	<0,5
<0,5		4,9	4,3	0,1	0,07	0,01	0,2	0,4	6,7	7,3	3	67	<0,5
		5,5	5,9	0,1	0,01	0,01	0,1	0	1,8	1,9	5	0	

Equivalente de CaCO3 %	Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H2SO4 (1:1) e NaOH (0,8%)						SiO2 / Al2O3 (Ki)	SiO2 / R2O3 (Kr)	Al2O3 / Fe2O3	Fe2O3 livre %	Equivalente de CaCO3 %
					SiO2	Al2O3	Fe2O3	TiO2	P2O5	MnO					
		3,11	0,39	8	8,6	31,1	14,4	0,62			0,47	0,36	3,39		
		2,22	0,31	7	9,4	31,3	15,9	0,74			0,51	0,39	3,09		
		0,91	0,15	6	9,5	31,2	16,0	0,66			0,52	0,39	3,06		

Equivalente de umidade	Horizonte	100 Na+ / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
			C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO3 − / CO3 =	Cl−	SO4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
31,0		<1													30,0
31,2		<1													29,6
32,3		1													32,3

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
CTC 6-1	0-10		1,1	98,9	6	3	17	74	36	51	0,23			
CTC 6-2	11-30		0,9	99,1	5	3	17	75	44	41	0,23			
CTC 6-3	31-130		1,4	98,6	5	4	15	76	6	92	0,20			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,9	4,0	0,3	0,18	0,01	0,5	1,4	8,7	10,6	5	74	<0,
	5,0	4,3	0,1	0,07	0,01	0,2	0,6	6,7	7,5	3	75	<0,
	5,5	5,7	0,1	0,01	0,01	0,1	0	2,0	2,1	5	0	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1) e NaOH (0,8%)						SiO 2 / Al 2 O 3 (Ki)	Si O 2 / R 2 O 3 (Kr)	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	3,05	0,39	8	10,7	31,0	14,9	0,68			0,59	0,45	3,26		
	2,25	0,31	7	10,5	31,6	15,4	0,78			0,56	0,43	3,22		
	0,93	0,11	8	10,7	31,5	16,5	0,72			0,58	0,43	3,00		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				m e q / 100g de TF										
	<1													29,9
	<1													29,8
	<1													30,9

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TC 7-1	0-8		1,4	98,6	6	3	13	78	48	38	0,17			
TC 7-2	9-37		0,8	99,2	5	3	12	80	44	45	0,15			
TC 7-3	38-120		0,9	99,1	6	3	9	82	0	100	0,11			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	P assimilável ppm
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4,9	4,0	0,2	0,14	0,01	0,4	1,2	8,9	10,5	4	75	<0,5
	5,0	4,3	0,1	0,05	0,01	0,2	0,5	6,1	6,8	3	71	<0,5
	5,3	5,3	0,1	0,01	0,01	0,1	0	3,1	3,2	3	0	<0,5

Horizonte	C (orgânico) %	N %	$\frac{C}{N}$	ATAQUE POR H_2SO_4 (1:1)						NaOH (0,8%)	$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\ O_2}{R_2O_3}$ (Kr	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO						
	2,96	0,38	8	12,5	31,6	14,6	0,74				0,67	0,52	3,33		
	2,01	0,29	7	12,6	32,0	14,4	0,89				0,67	0,52	3,49		
	1,11	0,18	6	12,7	33,0	15,2	0,94				0,65	0,51	3,41		

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← m e q / 100g de TF →										
	<1													29,9
	<1													30,4
	<1													29,6

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm				Aparente	Real	
CTC 8-1	0-8		1,1	98,9	5	3	15	77	30	61	0,19			
CTC 8-2	9-23		1,2	98,8	5	3	12	80	38	53	0,15			
CTC 8-3	24-100		1,0	99,0	5	3	11	80	6	93	0,14			
CTC 8-4	100-140		0,9	99,1	5	4	11	80	0	100	0,14			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	5,0	4,1	0,2	0,15	0,01	0,4	1,3	8,9	10,6	4	76	<0,5
	5,0	4,2	0,1	0,07	0,01	0,2	0,6	7,2	8,0	3	75	<0,5
	5,3	4,9	0,1	0,01	0,01	0,1	0,2	3,7	4,0	3	67	<0,5
	5,5	5,7	0,1	0,01	0,01	0,1	0	2,3	2,4	4	0	

Horizonte	C (orgânico) %	N %	C / N	ATAQUE POR H 2 SO 4 (1:1) NaOH (0,8%)						SiO_2 / Al_2O_3 (Ki)	Si O_2 / R_2O_3 (Kr	Al_2O_3 / Fe_2O_3	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
	3,10	0,36	9	12,7	32,1	14,2	0,83			0,67	0,52	3,54		
	2,36	0,30	8	12,9	32,0	14,5	1,01			0,69	0,53	3,46		
	1,32	0,13	10	13,1	31,9	14,8	0,92			0,70	0,54	3,38		
	0,83	0,09	9	13,0	31,4	15,0	0,84			0,70	0,54	3,28		

Horizonte	100 Na / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	$HCO_3^- + CO_3^=$	Cl−	$SO_4^=$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
	<1													29,9
	<1													29,7
	<1													29,5
	<1													29,4

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
CTC 9-1	0-25		1,0	99,0	7	3	15	75	36	52	0,20			
CTC 9-2	26-82		1,0	99,0	6	3	11	80	46	43	0,14			
CTC 9-3	83-138		1,0	99,0	7	4	13	76	0	100	0,17			

P assimilável ppm	Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\,Al^{+++}}{S + Al^{+++}}$	P assimilável ppm
		Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
<0,5		5,0	4,1	0,7		0,12	0,01	0,8	0,9	8,6	10,3	8	53	<0,5
<0,5		5,3	4,7	0,1		0,02	0,01	0,1	0,2	4,0	4,3	2	67	<0,5
<0,5		5,5	5,7	0,1		0,01	0,01	0,1	0	2,1	2,2	5	0	

Equivalente de $CaCO_3$ %	Horizonte	C (orgânico) %	N %	$\frac{C}{N}$	ATAQUE POR H 2 SO 4 (1:1)						NaOH (0,8%) $\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\,O_2}{R_2O_3}$ (Kr	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
					SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
		2,49	0,24	10	13,2	31,3	13,9	0,83			0,72	0,56	3,53		
		1,38	0,13	11	13,4	31,6	14,3	0,86			0,72	0,56	3,47		
		0,84	0,09	9	13,3	31,6	14,8	0,92			0,72	0,55	3,35		

Equivalente de umidade	Horizonte	$\frac{100\,Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
			C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
29,9		<1													29,0
29,7		<1													29,6
29,5		<1													29,7
29,4															

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte / % Argila	Densidade g/cm 3		Poros % (volu
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm				Aparente	Real	
CTC 10-1	0-29		1,5	98,5	5	3	15	77	42	45	0,19			
CTC 10-2	30-100		3,9	96,1	5	3	12	80	52	35	0,15			
CTC 10-3	101-140		1,3	98,7	6	4	10	80	0	100	0,13			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,8	4,0	0,3		0,14	0,01	0,5	1,4	9,8	11,7	4	74	<
	5,2	4,8	0,1		0,01	0,01	0,1	0,1	4,2	4,2	2	50	<
	5,3	5,6	0,1		0,01	0,01	0,1	0	2,5	2,6	4	0	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						ATAQUE POR NaOH (0,8%)				Equivalente de
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO	SiO2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	
	3,13	0,28	11	13,3	31,2	13,7	0,86			0,72	0,57	3,57		
	1,31	0,12	11	13,6	32,5	14,4	0,96			0,71	0,55	3,54		
	0,89	0,10	9	13,6	32,1	14,6	1,04			0,72	0,56	3,45		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umid
				m e q / 100g de TF										
	<1													29
	<1													29
	<1													29

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila <0,002 mm			% Argila	Aparente	Real	
CTC 11-1	0-20		0,7	99,3	4	2	12	82	53	35	0,15			
CTC 11-2	21-76		1,0	99,0	5	2	8	85	54	36	0,09			
CTC 11-3	77-120		0,7	99,3	4	2	9	85	0	100	0,11			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	Passimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,9	3,9	0,2		0,14	0,01	0,4	1,7	10,4	12,5	3	81	<0,5
	5,7	4,6	0,1		0,02	0,01	0,1	0,2	4,1	4,4	2	67	<0,5
	5,3	5,3	0,1		0,01	0,01	0,1	0	2,6	2,7	4	0	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0,8%)	SiO 2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	3,18	0,28	11	15,3	31,3	13,1	0,87			0,83	0,66	3,75		
	1,42	0,14	10	15,1	32,0	13,9	0,99			0,80	0,63	3,61		
	0,88	0,08	11	15,4	32,8	13,9	1,04			0,80	0,63	3,70		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25ºC	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				← m e q / 100g de TF →										
	<1													28,5
	<1													28,9
	<1													29,4

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
CTC 12-1	0-13		1,3	98,7	5	2	14	79	43	46	0,18			
CTC 12-2	14-72		1,1	98,9	4	2	7	87	56	36	0,08			
CTC 12-3	73-120		0,9	99,1	3	2	6	89	0	100	0,07			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	5,2	4,1	0,2	0,10	0,01	0,3	1,2	9,0	9,5	3	80	<0
	5,2	4,5	0,1	0,02	0,01	0,1	0,3	5,2	5,6	2	75	<0
	5,3	5,3	0,1	0,01	0,01	0,1	0	3,1	3,2	3	0	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)					NaOH (0,8%)	SiO2 / Al2O3 (Ki)	Si O2 / R 2 O 3 (Kr	Al 2 O 3 / Fe 2 O 3	Fe2 O3 livre %	Equivalente de
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO					
	2,56	0,29	9	15,8	31,4	14,1	0,90			0,86	0,67	3,49		
	1,77	0,21	8	15,6	30,7	13,2	0,98			0,86	0,68	3,65		
	0,90	0,10	9	15,8	31,9	14,2	1,01			0,84	0,66	3,52		

Horizonte	100 Na+ / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25ºC	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				m e q / 100g de TF										
	<1													29
	<1													29
	<1													29

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
TC 13-1	0-30		1,3	98,7	4	2	11	83	45	46	0,13			
TC 13-2	31-80		0,4	99,6	4	2	9	85	55	35	0,11			
TC 13-3	81-140		0,6	99,4	6	3	6	85	0	100	0,07			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	5,1	3,9	0,2	0,13	0,01	0,3	1,9	11,2	13,4	2	86	<0,5
	5,4	4,7	0,1	0,01	0,01	0,1	0,1	4,3	4,5	2	50	<0,5
	5,4	5,6	0,1	0,01	0,01	0,1	0	2,4	2,5	4	0	

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H 2 SO 4 (1:1)						ATAQUE POR NaOH (0.8%)				Equivalente de CaCO3 %
				SiO 2	Al 2 O 3	Fe 2 O 3	Ti O 2	P 2 O 5	MnO	SiO2 / Al 2 O 3 (Ki)	Si O2 / R 2 O 3 (Kr)	Al 2 O 3 / Fe 2 O 3	Fe 2 O 3 livre %	
	3,51	0,29	12	15,0	30,7	13,1	0,88			0,83	0,65	3,68		
	1,43	0,12	12	15,2	31,3	13,4	0,87			0,83	0,65	3,66		
	0,83	0,09	9	15,3	31,7	13,8	0,99			0,82	0,64	3,60		

Horizonte	100 Na + / T	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25ºC	Água %	Ca + +	Mg + +	K +	Na +	HCO 3 − / CO 3 =	Cl−	SO 4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
	<1													29,9
	<1													28,8
	<1													39,9

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
CTC 14-1	0-5/12		0,6	99,4	4	2	14	80	38	53	0,18			
CTC 14-2	5/12-36		1,2	98,8	4	3	14	79	52	34	0,18			
CTC 14-3	37-70		1,5	99,5	5	3	9	83	54	35	0,11			
CTC 14-4	71-120		0,6	99,4	7	4	12	77	0	100	0,16			

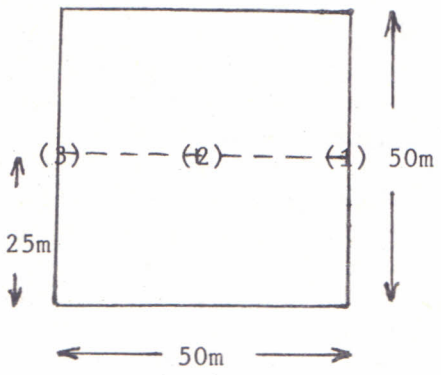
Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	P assimilável ppm
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	5,1	3,9	0,2	0,15	0,01	0,4	1,7	10,1	12,2	3	81	<0,
	5,3	4,2	0,1	0,05	0,01	0,2	0,8	6,8	7,8	3	80	<0,
	5,4	5,0	0,1	0,01	0,01	0,1	0	3,7	3,8	3	0	<0,
	5,3	5,4	0,1	0,01	0,01	0,1	0	2,4	2,5	4	0	

Horizonte	C (orgânico) %	N %	$\frac{C}{N}$	ATAQUE POR H_2SO_4 (1:1) e NaOH (0,8%)						$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\ O_2}{R_2O_3}$ (Kr	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
	3,23	0,29	11	15,3	31,5	13,1	0,86			0,83	0,65	3,77		
	2,04	0,21	10	15,8	33,7	13,2	0,89			0,80	0,64	4,00		
	1,14	0,13	9	15,5	33,1	14,0	0,99			0,80	0,63	3,71		
	0,95	0,10	10	14,7	31,3	14,2	0,93			0,80	0,62	3,46		

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	$HCO_3^{-} + CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
	<1													29,7
	<1													29,7
	<1													29,8
	<1													28,5

5. Cabeceira forest soils : Córrego Capitinga (MA)

Three profiles were located within the 50 x 50m square block described in Ratter (1980) pp 48-53. The sites were taken in a line midway across the block:-



The aim of this work was to describe and characterise the soils of the gallery forest (mata ciliar). On the assumption that the block is homogeneous, a triplicate set of profiles was considered sufficient to give an initial idea of the variation and level of soil properties.

The profiles are described in Table 15 and the physical and chemical properties are summarised in Table 16 (MA 1 to 3).

Table 15 : soil descriptions for the forest soils Córrego Capitinga

MA-1 : level forest

Horizon 1 (A1) : 4-1cm leaf litter
1-0cm clear fermentation layer
0-6cm brown to bright brown (7.5YR 4/4-5/6) with burnt organic matter, lighter colours in clay rich pockets, sandy loam, moderately strong and cohesive granular structure (where organic) to sub-angular blocky (where mineral), many small pores, dry smooth consistency, abundant fine and medium roots and thick surface root mat, clear horizontal boundary

Horizon 2 (A2) : 7-42/50cm brown (7.5 YR 4/6) sandy clay loam, weak poorly cohesive granular (<1mm epsd) and partly sub blocky angular (5-10mm) structure, many small pores, dry loose consistency, medium roots common with few fine roots, diffuse horizontal boundary

Horizon 3 (B2) : 42/50-96cm bright brown (7.5 YR 5/6) sandy clay loam, weak poorly cohesive massive structure fragmenting to sub-angular blocky (20-50mm), many small pores, dry friable consistency, medium root common with occasional fine roots, clear horizontal boundary

Horizon 4 (C) : 97-120cm bright reddish brown (5 YR 5/8) with reddish brown nodules (2.5 YR 4/8), sandy clay loam compacted with depth(matrix), non-cohesive and structureless, many small pores in matrix, dry friable consistency (matrix), strongly cemented at base (Fe_2O_3?), very few roots compacted stones

MA-2 : level forest

Horizon 1 (A1) : 4-1cm leaf litter; 1-0cm fermention layer
0-15cm dark brown (7.5 YR 3/4) gravelly sandy loam, moderately strong and cohesive granular structure (dominantly <1mm epsd), many very small pores, dry smooth consistency, abundant roots and root mat, clear horizontal and sinuous boundary

Horizon 2 (A2) : 16-60cm brown (7.5 YR 4/4) slightly gravelly sandy loam, moderate poorly cohesive granular structure, many small pores, dry friable consistency, abundant fine and medium roots, gradual horizontal boundary

Horizon 3 (?B) : 61-86cm bright brown (7.5 YR 5/8) stony and gravelly sandy loam, weak poorly cohesive granular structure, many small pores, dry friable consistency, medium roots common, gradual horizontal boundary

Horizon 4 (C) : 87-115cm reddish brown matrix (2.5 YR 4/8) with red weathered nodules (10 R 4/8) to dark red (10 R 3/8), sandy loam matrix, massive structureless, many small pores (matrix), dry friable consistency (matrix), occasional roots; lower horizons seem to be developed in weathered compacted red shale

MA-3 : slight gradient (3^0); open cabeceira forest with tall grass

Horizon 1 (A1) : 3-1cm grass and leaf litter; 1-0cm fermentation layer
0-6cm dark brown (10 YR 3/3) sandy loam, moderate poorly cohesive granular structure (<1mm epsd), many small pores, dry friable consistency, abundant fine and medium roots with root mat, clear sinuous horizontal boundary

Horizon 2 (A2) : 7-62cm dark brown (10 YR 3/4) patchy, sandy loam, moderate very poorly cohesive granular structure, many small pores, dry friable consistency, abundant fine and medium roots, diffuse horizontal boundary

Horizon 3 (B2) : 63-69cm, brown (10 YR 4/6), sandy loam, weak very poorly cohesive granular structure, many small pores, dry friable consistency, fine and medium root common, diffuse horizontal boundary.

Horizon 4 (B3/C) : 97-130+cm, yellowed brown (10 YR 5/6), loamy sand, structureless, many small pores, dry friable consistency, occasional medium roots.

Table 16 : Soil analyses : Cabeceira forest (MA 1-3)

Horizonte		Frações da amostra total %			terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
MA 1-1	0-6		3,3	96,7	3	18	35	44	22	50	0,80			
MA 1-2	7-42/50		13.9	86.1	3	22	25	50	33	34	0,50			
MA 1-3	42/50-96		9.9	90.1	3	21	25	51	42	18	0,49			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	$\frac{100\,Al^{+++}}{S + Al^{+++}}$	P assimilável ppm
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4,7	3,8	0,8		0,42	0,02	1,2	4,4	16,9	22,5	5	79	1
	4,8	3,9	0,3		0,13	0,01	0,4	2,6	7,7	10,7	4	87	<0,5
	4,8	3,9	0,1		0,07	0,01	0,2	1,8	4,4	6,4	3	90	<0,5

Horizonte	C (orgânico) %	N %	$\frac{C}{N}$	ATAQUE POR H_2SO_4 (1:1)					NaOH (0,8%)	$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\,O_2}{R_2O_3}$ (Kr	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
	5,90	0,65	10	11,4	17,3	5,7	0,35			1,12	0,94	4,76		
	1,96	0,25	8	12,1	18,6	6,6	0,36			1,11	0,90	4,42		
	0,98	0,12	8	11,7	19,8	7,1	0,42			1,00	0,82	4,37		

Horizonte	$\frac{100\,Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
	<1													29,3
	<1													24,3
	<1													23,3

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mn	Cascalho 20-2 mm	Terra fina < 2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila < 0,002 mm			% Argila	Aparente	Real	
MA 2-1	0-15		12,5	87,5	5	14	43	38	20	47	1,13			
MA 2-2	16-60		20,0	80,0	5	20	26	49	20	59	0,53			
MA 2-3	61-86	15,3	51,8	32,9	7	21	23	49	33	33	0,47			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g								Valor V (sat. de bases) %	$\frac{100\ Al^{+++}}{S + Al^{+++}}$	P assimilável ppm
	Água	KCL 1N	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Valor S (soma)	Al^{+++}	H^{+}	Valor T (soma)			
	4,3	3,4	0,5		0,31	0,02	0,8	7,6	25,6	34,0	2	90	<1
	4,8	4,0	0,1		0,07	0,01	0,2	2,7	10,4	13,3	2	93	<0,5
	4,8	4,0	0,1		0,04	0,01	0,2	2,0	6,4	8,6	2	91	<0,5

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H_2SO_4 (1:1) e NaOH (0,8%)						$\frac{SiO_2}{Al_2O_3}$ (Ki)	$\frac{Si\ O_2}{R_2O_3}$ (Kr)	$\frac{Al_2O_3}{Fe_2O_3}$	Fe_2O_3 livre %	Equivalente de $CaCO_3$ %
				SiO_2	Al_2O_3	Fe_2O_3	TiO_2	P_2O_5	MnO					
	7,55	0,66	11	11,7	17,0	5,4	0,34			1,17	0,97	4,93		
	2,46	0,25	10	11,2	18,4	6,7	0,43			1,03	0,84	4,13		
	1,37	0,19	7	11,8	20,0	6,9	0,43			1,00	0,82	4,55		

Horizonte	$\frac{100\ Na^{+}}{T}$	Pasta saturada		Sais solúveis (extrato 1:5) m e q / 100g de TF							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	HCO_3^{-} $CO_3^{=}$	Cl^{-}	$SO_4^{=}$	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
	<1													32,7
	<1													24,7
	<1													23,9

Horizonte		Frações da amostra total %			Composição granulométrica da terra fina (dispersão com NaOH calgon) %				Argila dispersa em água %	Grau de floculação %	% Silte	Densidade g/cm 3		Porosidade % (volume)
Símbolo	Profundidade cm	Calhaus > 20 mm	Cascalho 20-2 mm	Terra fina <2 mm	Areia grossa 2 - 0,20 mm	Areia fina 0,20 - 0,05 mm	Silte 0,05 - 0,002 mm	Argila <0,002 mm			% Argila	Aparente	Real	
VA 3-1	0-6		11,7	88,3	7	17	36	40	24	40	0,90			
VA 3-2	7-62		9,5	90,5	4	18	32	46	28	39	0,70			
VA 3-2	63-96		11,1	88,9	4	21	27	48	43	10	0,56			
VA 3-4	97-130		8,3	91,7	4	21	27	48	42	13	0,56			

Horizonte	pH (1:2,5)		Complexo sortivo meq/100g							Valor V (sat. de bases) %	100 Al + + + / S + Al + + +	P assimilável ppm
	Água	KCL 1N	Ca + +	Mg + +	K +	Na +	Valor S (soma)	Al + + +	H +	Valor T (soma)			
	4,5	3,6	0,8	0,25	0,02	1,1	6,1	20,0	27,2	4	85	1
	4,8	4,0	0,1	0,06	0,01	0,2	2,8	10,2	13,2	2	93	<0,5
	4,7	3,8	0,1	0,03	0,01	0,1	2,5	6,0	8,6	1	96	<0,5
	4,7	3,8	0,1	0,04	0,01	0,2	2,1	4,5	6,8	3	91	<0,5

Horizonte	C (orgânico) %	N %	C/N	ATAQUE POR H2SO4 (1:1)						ATAQUE POR NaOH (0,8%)				Fe2O3 livre %	Equivalente de CaCO3 %
				SiO2	Al2O3	Fe2O3	TiO2	P2O5	MnO	SiO2/Al2O3 (Ki)	SiO2/R2O3 (Kr)	Al2O3/Fe2O3			
	6,57	0,65	10	13,8	16,1	2,6	0,36			1,46	1,32	9,68			
	2,48	0,33	8	13,9	20,0	3,5	0,47			1,18	1,06	8,95			
	1,58	0,13	12	12,9	20,4	3,6	0,49			1,08	0,97	8,89			
	0,94	0,12	8	13,0	20,1	3,6	0,46			1,10	0,99	8,76			

Horizonte	100 Na+ / T	Pasta saturada		Sais solúveis (extrato 1:5)							Constantes hídricas %			
		C.E do extrato mmhos/cm 25°C	Água %	Ca + +	Mg + +	K +	Na +	HCO3 − / CO3 =	Cl−	SO4 =	Umidade 1/3 atm	Umidade 15 atm	Água disponível máxima	Equivalente de umidade
				m e q / 100g de TF										
	<1													33,1
	<1													26,4
	<1													24,6
	<1													22,7

6. Soils associated with Luhea paniculata (LP)

The distinctive relationship between deciduous forest and mesotrophic soils in the Planalto Central has been noted on several occasions (for example, Ratter et al 1977).

At Fazenda Agua Limpa the localised frequency of Luhea paniculata was believed to relate to more favourable soil conditions. Luhea may therefore act as a useful indicator species of mesotrophic soil conditions. Two profiles were described and analysed in order to test this theory (Furley, Haridasan and Ratter 1983). In addition to Luhea paniculata Mart., other indicators of more favourable conditions are also found in association, notably Platypodium grandiflorum Benth., Terminalia argentea Mart. and Zucc. and Pseudobombax tomentosum Mart. and Zucc.

The profile descriptions for the two sites are given in Table 17 whilst Table 18 summarises the analyses undertaken in the Laboratorio de Ecologia, Universidade de Brasilia. A comparison is also made with a nearby cerrado site (LP3) to illustrate the differences between mesotrophic and dystrophic soils.

The strikingly high surface horizon levels at the Luhea sites for pH, organic carbon, calcium, magnesium, potassium, manganese and zinc are clear from Table 18. The increase in iron is very noticeable in horizons A2/3 but curiously not so dominant in the cemented B horizon (although this may be an artifact of the extraction method). The relationship between a mesotrophic soil surface horizon and Luhea and its associates is therefore clear. However, the rapid decrease in levels with depth raises several questions as to the origin of the higher figures and their cycling mechanisms, which may relate more to the thick grass (Capim gordura) than to the tree components.

By way of comparison with more typically dystrophic conditions, a nearby woody cerrado site was described and analysed (LP3). The results are added to Tables 17 and 18 respectively.

Table 17 : soil descriptions for the Luhea paniculata site

LP-1 : 5° slope; 100 m upslope from Corrego da Onca;
open arboreal cerrado with capim gordura (Melinis minutiflora)
Red Yellow Latosol with plinthitic B Horizon.

Horizon 1 (A1) : 3-0 cm grass and slight leaf litter plus fine gravel
0-5 cm, dark yellowish to dark brown (10 YR 4/3 - 3/3), gravelly loam, moderate poorly cohesive granular structure (<1 mm epsd), many small pores, weak slight lustre, dry friable consistency, slight gravel cementation mostly <1 cm, abundant fine and medium root, clear horizontal boundary.

Horizon 2 (A2/3) : 6-41 cm, brown (4/4 - 4/6) very gravelly gritty clay loam, moderate poorly cohesive granular structure, many small pores, weak slight lustre, dry friable consistency, very frequent gravel cementation (<1 cm and over), abundant fine and medium roots, gradual irregular boundary.

Horizon 3 (B2/3 ir) : 42-96+ cm, bright brown (7.5 YR 5/8) to dark reddish brown (2.5 YR 3/4), stoney, gravelly with gritty clay loam matrix, weak very poorly cohesive structure (<1 mm), many small pores (matrix), weak slight lustre, extremely cemented gravel and larger nodular masses (ironstone) >20 cm to <1 cm, average c.3 cm, fine roots common.

LP-2 : 75 m upslope of LP-1
1-2° slope
Luhea paniculata, young palms, thick ground cover of capim gordura.

Horizon 1 (A1) : 3-0 cm grass and slight leaf litter, surface gravels (< 1 cm epsd)
0-5 cm greyish yellow brown (10 YR 4/2) gritty clay loam, moderately strong and cohesive granular structure (medium and small), many small pores, slight weak lustre, dry friable consistency, frequent gravel especially at surface, abundant fine to medium (5 cm diam.) roots, clear horizontal boundary.

Horizon 2 (A2/3) : 6-40 cm, brown (10 YR 4/4) with very dark reddish brown gravel (2.5 YR 2/3), gritty sandy clay, weak very poorly cohesive structure (<1 mm), many small pores, weak slight lustre, dry friable consistency, cemented gravel aggregate av. 1-2 cm epsd, abundant fine and medium roots, gradual irregular boundary.

Horizon 3 (B2/3 ir) : 41-100+cm, bright brown (7.5 YR 5/6) with dark dark reddish brown nodules (2.5 YR 2/3), strong and gravelly with gritty clay matrix, weak very poorly cohesive structure, many small pores (matrix), weak slight lustre, dry friable consistency, cemented stone and gravel aggregates (ironstone) av. 3-4 cm epsd (max 14 cm), fine roots common.

LP-3 : 1 Km upstream
level ground
dense arboreal cerrado (similar to CER 1)

Horizon 1 (A1) : 0-9 cm, dark brown (10 YR 3/4) sandy clay loam, moderately strong and cohesive granular structures (medium), many very small pores, slight weak lustre, dry hard consistency, frequent fine roots (max cm diam), clear level boundary.

Horizon 2 (A2/3) : 10-48 cm, brown (10 YR 4/6) clay loam, moderately strong and cohesive granular structure (medium), many very small pores, slight weak lustre, dry hard consistency, frequent fine roots, gradual level boundary.

Horizon 3 (B) : 49-118 cm, bright brown (7.5 YR 5/8) clay, weak very weakly cohesive semi angular blocky structure, many very fine pores, slight weak lustre, dry friable consistency, roots common rarely 1 cm.

Table 18 : Soil analyses for the Luhea paniculata site

Number	Depth (cm)	pH (H_2O)	pH (KCl)	Organic C(%)	Total N(%)	P (ppm)	Ca (ppm)	Mg (ppm)	Na (ppm)	K (ppm)	Fe (ppm)	Mn (ppm)	Zn (ppm)	Cu (ppm)	Al (100meq/g)
LP-1-1	0-5	6.2	5.3	5.0	0.33	2.0	3511	246	1.3	129	25	153	1.67	0.38	0.05
LP-1-2	6-41	5.5	4.3	2.0	0.15	0.7	33	14	0.4	24	50	23	0.61	0.99	0.42
LP-1-3	42-96	5.5	4.7	1.3	0.10	75.0	18	16	0.3	27	28	12	0.42	0.99	0.14
LP-2-1	0-5	6.3	5.3	5.7	0.38	2.7	4162	377	1.5	171	28	94	1.39	0.23	0.05
LP-2-2	6-40	5.2	4.3	1.0	0.13	0.7	25	7	1.7	30	80	12	0.69	0.99	0.56
LP-2-3	41-100	5.1	4.6	1.2	0.10	tr	7	0.9	0.4	11	28	7	0.56	0.69	0.23
LP-3-1	0-9	5.4	4.1	3.0	0.20	0.7	16	5.5	0.8	66	100	15.6	0.53	0.69	0.75
LP-3-2	10-48	5.7	4.5	1.6	0.10	tr	0.6	0.6	0.4	21	59	4.0	0.33	0.53	0.19
LP-3-3	49-118	5.2	5.4	0.8	0.05	tr	0.6	0.4	0.3	6	15	3.3	0.19	0.23	0.05

Table 18 : Soil analyses for the Luhea paniculata site

English terms for soil analytical data

Symbols and derivations of ratios are given in Table 8

Horizonte	: horizon
Símbolo	: symbol/code
Profundidade	: depth
Frações da amostra total	: fractions of total sample
Calhaus	: pebbles/stones
Cascalho	: gravel
Terra fina	: fine earth
Composição granulometrica	: granulometric composition
Areia grossa	: coarse sand
Areia fina	: fine sand
Silte	: silt
Argila	: clay
Argila dispersa em água	: clay dispersed in water
Grau de floculação	: degree of flocculation
Complexo sortivo	: exchange complex
Valor	: value
Soma	: sum
Ataque por (H_2SO_4)	: acid attack

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